

ASTRONOMICAL PHENOMENA

FOR THE YEAR

1997

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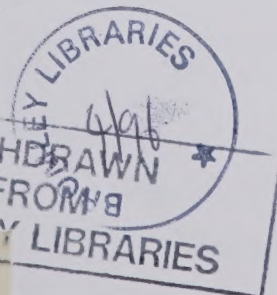
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FOR THE YEAR 1997

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The astronomical data in this booklet are expressed in the scale of universal time (UT); this is also known as Greenwich mean time (GMT) and is the standard time of the Greenwich meridian (0° of longitude). A time in UT may be converted to local mean time by the addition of east longitude (or subtraction of west longitude), where the longitude of the place is expressed in time-measure at the rate of 1 hour for every 15°. The differences between standard times and UT are indicated in the chart on page 22; local clock times may, however, differ from these standard times, especially in summer when clocks are often advanced by 1 hour.

PRINCIPAL PHENOMENA OF SUN AND MOON, 1997

THE SUN

Perigee	... Jan.	d h	2 00	Equinoxes	... Mar.	d h m	20 13 55	... Sept.	d h m	22 23 56
Apogee	... July	d h	4 19	Solstices	... June	d h m	21 08 20	... Dec.	d h m	21 20 07

PHASES OF THE MOON

Lunation	New Moon	First Quarter	Full Moon	Last Quarter
	d h m	d h m	d h m	d h m
915				Jan. 2 01 45
916	Jan. 9 04 26	Jan. 15 20 02	Jan. 23 15 11	Jan. 31 19 40
917	Feb. 7 15 06	Feb. 14 08 57	Feb. 22 10 27	Mar. 2 09 37
918	Mar. 9 01 15	Mar. 16 00 06	Mar. 24 04 45	Mar. 31 19 38
919	Apr. 7 11 02	Apr. 14 17 00	Apr. 22 20 33	Apr. 30 02 37
920	May 6 20 46	May 14 10 55	May 22 09 13	May 29 07 51
921	June 5 07 03	June 13 04 51	June 20 19 09	June 27 12 42
922	July 4 18 40	July 12 21 44	July 20 03 20	July 26 18 28
923	Aug. 3 08 14	Aug. 11 12 42	Aug. 18 10 55	Aug. 25 02 23
924	Sept. 1 23 52	Sept. 10 01 31	Sept. 16 18 50	Sept. 23 13 35
925	Oct. 1 16 51	Oct. 9 12 22	Oct. 16 03 46	Oct. 23 04 48
926	Oct. 31 10 01	Nov. 7 21 43	Nov. 14 14 12	Nov. 21 23 58
927	Nov. 30 02 14	Dec. 7 06 09	Dec. 14 02 37	Dec. 21 21 43
928	Dec. 29 16 56			

ECLIPSES

Total eclipse of the Sun	Mar. 8-9	E. Asia except S., N. Pacific Ocean including Japan, Arctic regions, Alaska and W. Canada.
Partial eclipse of the Moon	Mar. 24	Part of Antarctica, W. Africa, Europe except the extreme E. but including the British Isles, Iceland, Greenland, Arctic regions, The Americas except the N.W.
Partial eclipse of the Sun	Sept. 1-2	The S.E. Indian Ocean, part of Antarctica, Australia, New Zealand and the S.W. Pacific Ocean.
Total eclipse of the Moon	Sept. 16	Antarctica, the W. Pacific Ocean, Australasia, Asia except the extreme N.E., the Indian Ocean, Africa, Europe including the British Isles and the S.E. Atlantic Ocean.

MOON AT PERIGEE

MOON AT APOGEE

Jan.	^d 10 ^h 09	May	^d 29 ^h 07	Oct.	^d 15 ^h 02	Jan.	^d 25 ^h 17	June	^d 12 ^h 05	Oct.	^d 27 ^h 09
Feb.	7 21	June	24 05	Nov.	12 08	Feb.	21 17	July	9 23	Nov.	24 02
Mar.	8 09	July	21 23	Dec.	9 17	Mar.	21 00	Aug.	6 14	Dec.	21 23
Apr.	5 17	Aug.	19 05			Apr.	17 15	Sept.	2 21		
May	3 11	Sept.	16 15			May	15 10	Sept.	29 23		

OCCULTATIONS OF PLANETS AND BRIGHT STARS BY THE MOON

Date	Body	Areas of Visibility
Jan. ^d 19 ^h 06	<i>Aldebaran</i>	N.E. Russia, N. of Japan, the Arctic Ocean, Alaska, Canada, Greenland, and Iceland
Feb. 15 11	<i>Aldebaran</i>	The Middle East, N. India, Russia except the extreme N.W., N. China, Japan except the S., S.W. Alaska
Mar. 14 19	<i>Aldebaran</i>	Central America, S.E. of N. America, Iceland, Europe except extreme N. but including British Isles, N. Africa, extreme E. Russia, The Middle East
Apr. 11 04	<i>Aldebaran</i>	S.E. Asia, Japan, Alaska except extreme N., W. and central N. America
May 4 16	Saturn	N. America except Florida, Greenland, the British Isles
May 5 16	Mercury	Antarctic Peninsula, tip of S. America, extreme S. Atlantic Ocean
May 8 14	<i>Aldebaran</i>	E. of N. America, the Caribbean, S. Greenland, Europe including the British Isles, Turkey, E. Russia
June 1 03	Saturn	Central Africa, Saudi Arabia, India except S., China except S.E., S.E. Russia, Japan
June 13 16	Mars	Central Africa, Madagascar, Indian Ocean
June 28 12	Saturn	Pacific Ocean, central America, N.W. of S. America, Florida, extreme N.W. Africa
July 2 05	<i>Aldebaran</i>	Europe except extreme N. but including the British Isles, N. Africa, N. Saudi Arabia, Russia, N. China, Japan
July 25 19	Saturn	Indonesia, N.W. Australia, Pacific Ocean, Hawaiian Islands
July 29 11	<i>Aldebaran</i>	S. of N. America, Central America, Europe except N. but including the British Isles, N. Africa
Aug. 5 19	Mercury	Extreme N. of N. America, Greenland, extreme E. Europe, Arctic Ocean
Aug. 22 02	Saturn	E. of S. America, central Africa, Saudi Arabia, India
Aug. 25 17	<i>Aldebaran</i>	Pacific Ocean, S. of N. America, Central America
Sept. 18 10	Saturn	Pacific Ocean, S. of N. America, Central America
Sept. 22 00	<i>Aldebaran</i>	Central Africa, Middle East, N. India, China, S. Russia, S. Japan
Oct. 15 18	Saturn	Central Africa, Saudi Arabia, India, China, S.E. Russia, Japan
Oct. 19 09	<i>Aldebaran</i>	Hawaiian Islands, central N. America, Atlantic Ocean
Nov. 12 01	Saturn	Central America, N. of S. America, S. of N. America, Europe except N. but including British Isles, N.E. Africa
Nov. 15 20	<i>Aldebaran</i>	N. Africa, S.E. Europe, Middle East, Russia except Arctic regions, N. China, Japan
Dec. 9 07	Saturn	New Guinea, N. tip of Australia, Hawaiian Islands, S.W. of N. America
Dec. 13 05	<i>Aldebaran</i>	Hawaiian Islands, N. America except extreme N., extreme E. of Europe including the British Isles.

GEOCENTRIC PHENOMENA

MERCURY

Inferior conjunction ...	Jan.	d h 2 01	Apr.	d h 25 11	Aug.	d h 31 14	Dec.	d h 17 08
Stationary	Jan.	12 21	May	7 18	Sept.	9 06	Dec.	27 13
Greatest elongation West	Jan.	24 05 (25°)	May	22 23 (25°)	Sept.	16 22 (18°)	—	
Superior conjunction ...	Mar.	11 16	June	25 19	Oct.	13 21	—	
Greatest elongation East	Apr.	6 01 (19°)	Aug.	4 00 (27°)	Nov.	28 16 (22°)	—	
Stationary	Apr.	15 05	Aug.	17 03	Dec.	7 16	—	

VENUS

Superior conjunction ...	Apr.	d h 2 14	Greatest brilliancy ...	Dec.	d h 11 23
Greatest elongation East	Nov.	6 07 (47°)	Stationary	Dec.	25 14

EARTH

Perihelion ...	Jan.	d h 2 00	Equinoxes ...	Mar.	d h m 20 13 55	Sept.	d h m 22 23 56
Aphelion ...	July	4 19	Solstices ...	June	21 08 20	Dec.	21 20 07

SUPERIOR PLANETS

	Conjunction	Stationary	Opposition	Stationary
	d h	d h	d h	d h
Mars	—	Feb. 6 18	Mar. 17 08	Apr. 29 06
Jupiter	Jan. 19 13	June 10 11	Aug. 9 14	Oct. 8 07
Saturn	Mar. 30 22	Aug. 2 19	Oct. 10 04	Dec. 17 11
Uranus	Jan. 24 14	May 13 09	July 29 19	Oct. 14 14
Neptune	Jan. 17 13	May 1 23	July 21 07	Oct. 8 22
Pluto	Nov. 27 17	Mar. 10 06	May 25 10	Aug. 16 05

HELIOCENTRIC PHENOMENA

	Aphelion	Perihelion	Greatest Lat. North	Descending Node	Greatest Lat. South	Ascending Node
Mercury	Feb. 11	Mar. 27	Jan. 8	Jan. 31	Mar. 3	Mar. 22
	May 10	June 23	Apr. 6	Apr. 29	May 30	June 18
	Aug. 6	Sept. 19	July 3	July 26	Aug. 26	Sept. 14
	Nov. 2	Dec. 16	Sept. 29	Oct. 22	Nov. 22	Dec. 11
	—	—	Dec. 26	—	—	—
Venus	Feb. 23	June 15	—	Jan. 19	Mar. 17	May 12
	Oct. 5	—	July 6	Aug. 31	Oct. 27	Dec. 23
Mars	Jan. 29	—	—	July 8	Dec. 12	—

Jupiter, Saturn, Uranus, Neptune, Pluto: None in 1997

VISIBILITY OF PLANETS

MERCURY can only be seen low in the east before sunrise, or low in the west after sunset (about the time of the beginning or end of civil twilight). It is visible in the mornings between the following approximate dates: January 8 to March 1, May 4 to June 18, September 8 to October 2, and December 23 to December 31. The planet is brighter at the end of each period, (the best conditions in northern latitudes occur during the third week of September, and in southern latitudes from mid-May to the first few days of June). It is visible in the evenings between the following approximate dates: March 21 to April 17, July 3 to August 25 and October 29 to December 11. The planet is brighter at the beginning of each period, (the best conditions in northern latitudes occur from the end of March to the beginning of the second week of April, and in southern latitudes from mid-July to mid-August).

VENUS is a brilliant object in the morning sky from the beginning of the year until the end of the third week of February when it becomes too close to the Sun for observation. During the second week of May it reappears in the evening sky where it stays until the end of the year. Venus is in conjunction with Mercury on January 12, with Jupiter on February 6 and with Mars on October 26 and December 22.

MARS can be seen in the morning sky in Virgo until a few days after mid-March. It is at opposition on March 17 when it is visible throughout the night. Its eastward elongation gradually decreases, moving into Leo in late March and into Virgo in early June (passing $1^{\circ}7'$ N of *Spica* on August 2). It can only be seen in the evening sky after mid-June moving into Libra in late August, Scorpius in late September and Ophiuchus in the second week of October (passing 3° N of *Antares* on October 11). It then continues into Sagittarius in early November and into Capricornus after mid-December. Mars is in conjunction with Venus on October 26 and December 22.

JUPITER can be seen in the evening sky in Sagittarius for the first week of January after which it becomes too close to the Sun for observation. It reappears in the morning sky from the beginning of February in Capricornus, in which constellation it remains throughout the year. Its westward elongation gradually increases and after mid-May it can be seen for more than half the night. It is at opposition on August 9 when it is visible throughout the night. Its eastward elongation then decreases and after the first week of November until the end of the year it can only be seen in the evening sky. Jupiter is in conjunction with Venus on February 6 and with Mercury on February 12.

SATURN can be seen in the evening sky in Pisces until mid-March when it becomes too close to the Sun for observation. It reappears in the morning sky from mid-April in Cetus. Its westward elongation gradually increases passing into Pisces again during the second week of April in which constellation it remains for the rest of the year. It is at opposition on October 10 when it is visible throughout the night. Its eastward elongation then gradually decreases and for the rest of the year can be seen for more than half the night.

URANUS is visible as an evening star at the very beginning of the year in Capricornus and remains in this constellation throughout the year. It then becomes too close to the Sun for observation until mid-February, when it reappears in the morning sky. It is at opposition on July 29 when it can be seen throughout the night, after which its eastward elongation gradually decreases until from the end of October it can only be seen in the evening sky.

NEPTUNE is too close to the Sun for observation until after the first week of February when it appears in the morning sky in Sagittarius. It passes into Capricornus after the first week of April and into Sagittarius again at the end of May, remaining in this constellation throughout the year. It is at opposition on July 21 when it can be seen throughout the night. Its eastward elongation gradually decreases and from mid-October until late December it can be seen in the evening sky, after which it again becomes too close to the Sun for observation.

DO NOT CONFUSE (1) Venus with Mercury around mid-January, at the beginning of the third week in February and late July to early August and with Jupiter during the first half of February; on all occasions Venus is the brighter object. (2) Mars with Venus from mid-October to mid-November and around mid-December when Venus is the brighter object. (3) Jupiter with Mercury around mid-February when Jupiter is the brighter object.

VISIBILITY OF PLANETS IN MORNING AND EVENING TWILIGHT

	Morning	Evening
Venus	January 1 – February 21	May 12 – December 31
Mars	January 1 – March 17	March 17 – December 31
Jupiter	February 2 – August 9	January 1 – January 6 August 9 – December 31
Saturn	April 18 – October 10	January 1 – March 13 October 10 – December 31

VISIBILITY OF PLANETS

The planet diagram on page 9 shows, in graphical form for any date during the year, the local mean times of meridian passage of the Sun, of the five planets, Mercury, Venus, Mars, Jupiter and Saturn, and of every 2^h of right ascension. Intermediate lines, corresponding to particular stars, may be drawn in by the user if desired. The diagram is intended to provide a general picture of the availability of planets and stars for observation during the year.

On each side of the line marking the time of meridian passage of the Sun, a band 45^m wide is shaded to indicate that planets and most stars crossing the meridian within 45^m of the Sun are generally too close to the Sun for observation.

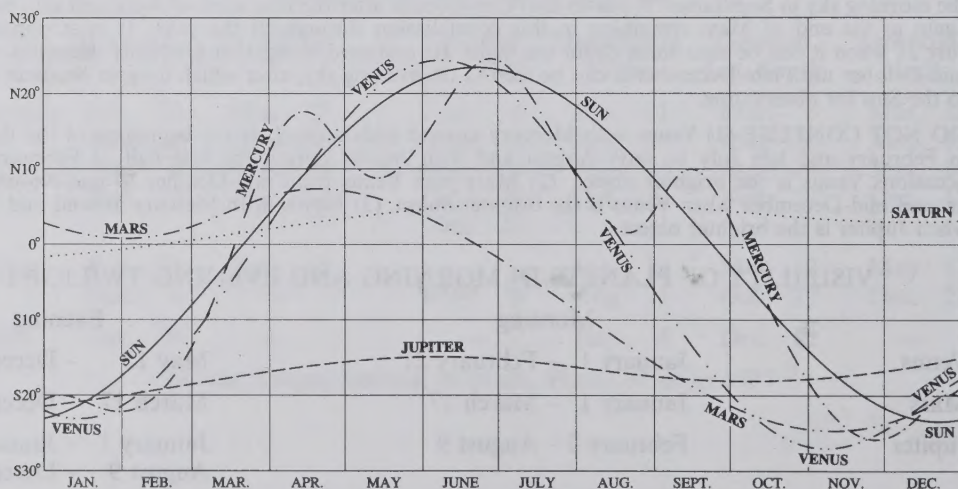
For any date the diagram provides immediately the local mean time of meridian passage of the Sun, planets and stars, and thus the following information:

- a) whether a planet or star is too close to the Sun for observation;
- b) visibility of a planet or star in the morning or evening;
- c) location of a planet or star during twilight;
- d) proximity of planets to stars or other planets.

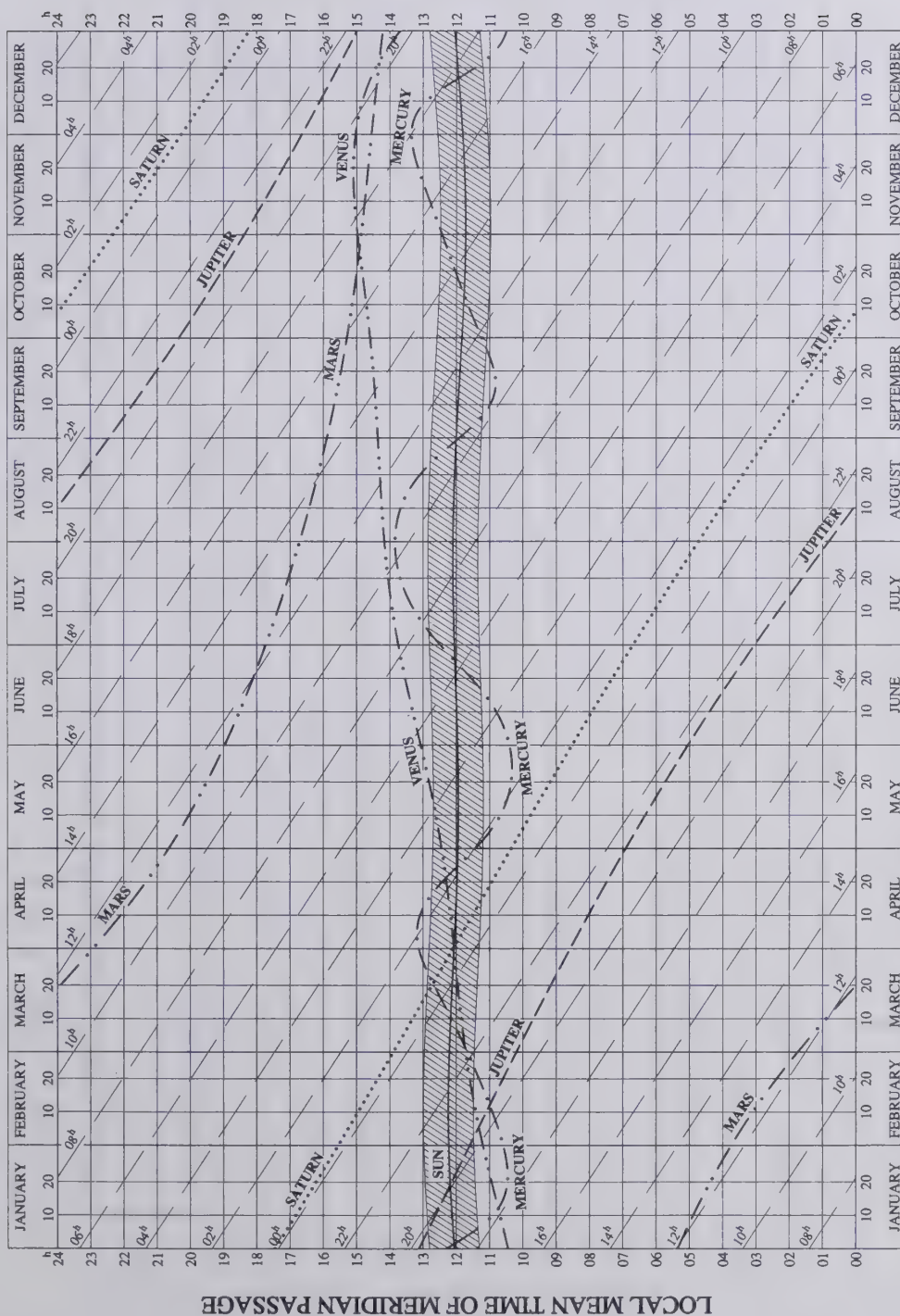
When the meridian passage of a body occurs at midnight, it is close to opposition to the Sun and is visible all night, and may be observed in both morning and evening twilights. As the time of meridian passage decreases, the body ceases to be observable in the morning, but its altitude above the eastern horizon during evening twilight gradually increases until it is on the meridian at evening twilight. From then onwards the body is observable above the western horizon, its altitude at evening twilight gradually decreasing, until it becomes too close to the Sun for observation. When it again becomes visible, it is seen in the morning twilight, low in the east. Its altitude at morning twilight gradually increases until meridian passage occurs at the time of morning twilight, then as the time of meridian passage decreases to 0^h, the body is observable in the west in the morning twilight with a gradually decreasing altitude, until it once again reaches opposition.

Notes on the visibility of the principal planets, except Pluto, are given on page 7. Further information on the visibility of planets may be obtained from the diagram below which shows, in graphical form for any date during the year, the declinations of the bodies plotted on the planet diagram on page 9.

DECLINATION OF SUN AND PLANETS, 1997



LOCAL MEAN TIME OF MERIDIAN PASSAGE



ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h UT

Mercury				Venus				Mercury				Venus			
Date		Elong.		Mag.		Elong.		Mag.		Date		Elong.		Mag.	
		°				°						°			
Jan.	-3	E.	11	+1.9		W.	23	-3.9		July	1	E.	6	-1.6	
	2	E.	3	4.8			22	3.9			6		12	1.0	
	7	W.	12	2.1			21	3.9			11		16	0.6	
	12		19	0.6			20	3.9			16		20	0.3	
	17		23	+0.1			18	3.9			21		23	-0.1	
Feb.	22	W.	24	-0.1		W.	17	-3.9		Aug.	26	E.	26	+0.1	
	27		24	0.1			16	3.9			31		27	0.3	
	1		23	0.1			15	3.9			5		27	0.4	
	6		22	0.2			14	3.9			10		26	0.7	
	11		20	0.2			13	3.9			15		24	1.0	
Mar.	16	W.	17	-0.3		W.	11	-3.9		Sept.	20	E.	19	+1.7	
	21		15	0.5			10	3.9			25		13	2.8	
	26		11	0.7			9	3.9			30	E.	5	4.5	
	3		8	1.0			8	3.9			4	W.	7	3.8	
	8	W.	4	1.4			7	3.9			9		14	1.6	
Apr.	13	E.	2	-1.8		W.	5	-3.9		Oct.	14	W.	17	+0.2	
	18		6	1.6			4	3.9			19		18	-0.6	
	23		11	1.3			3	3.9			24		15	1.0	
	28		15	1.0			2	3.9			29		12	1.2	
	2		18	-0.5		W.	1	3.9			4		8	1.3	
May	7	E.	19	+0.2		E.	2	-3.9		Nov.	9	W.	4	-1.4	
	12		17	1.2			3	3.9			14	E.	1	1.5	
	17		13	2.6			4	3.9			19		4	1.1	
	22	E.	6	4.5			5	3.9			24		7	0.8	
	27	W.	3	5.4			6	3.9			29		10	0.6	
June	27	W.	25	+0.3		E.	14	-3.9		Dec.	28	E.	22	-0.4	
	1		23	0.0			16	3.9			3		21	-0.2	
	6		20	-0.4			17	3.9			8		17	+0.5	
	11		17	0.8			18	3.9			13	E.	10	2.4	
	16		12	1.2			20	3.9			18	W.	3	4.8	
July	21	W.	6	-1.7		E.	21	-3.9			23	W.	13	+1.7	
	26	E.	1	2.2			22	3.9			28		19	+0.3	
	1	E.	6	-1.6		E.	24	-3.9			33	W.	22	-0.1	

MINOR PLANETS

		Conjunction	Stationary	Opposition	Stationary
Ceres	...	Jan. 14	July 14	Aug. 30	Oct. 24
Pallas	...	—	May 16	July 19	Sept. 8
Juno	...	July 24	—	—	—
Vesta	...	Feb. 3	Sept. 1	Oct. 17	Dec. 6

ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h UT

Date		Mars		Jupiter		Saturn		Uranus	Neptune	Pluto					
		Elong.	Mag.	Elong.	Mag.	Elong.	Mag.	Elong.	Elong.	Elong.					
Jan.	—8	W.	95	+0.6	E.	22	—1.9	E.	31	E.	25	W.	30		
	2		102	0.5		14	1.9		22		15		39		
	12		109	+0.2	E.	6	1.9		12	E.	5		48		
	22		117	0.0	W.	2	1.9		3	W.	4		58		
Feb.	1		126	—0.2		10	1.9		7		14		68		
Mar.	11	W.	136	—0.5	W.	18	—1.9	E.	42	W.	17	W.	77		
	21		148	0.8		25	1.9		33		26		87		
	3		160	1.0		33	2.0		24		36		97		
	13	W.	173	1.2		41	2.0		16		45		106		
	23	E.	171	1.2		49	2.0	E.	7		55		116		
Apr.	2	E.	158	—1.1	W.	57	—2.1	W.	3	W.	64	W.	73	W.	126
	12		146	0.9		65	2.1		11		74		82		135
	22		135	0.6		74	2.2		19		83		92		145
May	2		125	0.4		82	2.3		28		93		102		154
	12		117	—0.2		91	2.3		36		103		111		162
June	22	E.	109	0.0	W.	100	—2.4	W.	45	W.	112	W.	121	W.	167
	1		102	+0.2		109	2.5		53		122		131	E.	166
	11		96	0.3		118	2.5		62		132		141		159
July	21		91	0.5		128	2.6		71		142		150		151
	1		86	0.6		138	2.7		80		151		160		142
Aug.	11	E.	82	+0.7	W.	148	—2.7	W.	89	W.	161	W.	170	E.	133
	21		77	0.8		159	2.8		98	W.	171	W.	179		124
	31		74	0.8	W.	170	2.8		107	E.	179	E.	170		114
	10		70	0.9	E.	179	2.8		117		169		161		105
	20		66	1.0		169	2.8		127		159		151		96
Sept.	30	E.	63	+1.0	E.	158	—2.8	W.	137	E.	149	E.	141	E.	86
	9		60	1.0		147	2.7		147		139		131		77
	19		57	1.1		137	2.7		157		129		121		68
	29		54	1.1		126	2.6		168		119		111		58
Oct.	9		51	1.1		116	2.6	W.	177		109		101		49
Nov.	19	E.	49	+1.1	E.	107	—2.5	E.	170	E.	99	E.	92	E.	40
	29		46	1.1		97	2.4		160		89		82		31
	8		43	1.1		88	2.4		149		79		72		22
	18		41	1.1		79	2.3		139		70		62	E.	15
	28		39	1.1		70	2.2		128		60		52	W.	12
Dec.	8	E.	36	+1.2	E.	62	—2.2	E.	118	E.	50	E.	42	W.	16
	18		34	1.2		53	2.1		107		40		32		23
	28		31	1.2		45	2.1		97		31		23		32
	38	E.	29	+1.2	E.	37	—2.1	E.	87	E.	21	E.	13	W.	41

Magnitudes at opposition: Uranus 5.7 Neptune 7.8 Pluto 13.7

VISUAL MAGNITUDES OF MINOR PLANETS

	Jan. 2	Feb. 11	Mar. 23	May 2	June 11	July 21	Aug. 30	Oct. 9	Nov. 18	Dec. 28
Ceres	8.9	9.1	9.3	9.2	8.9	8.3	7.6	8.3	8.9	9.2
Pallas	10.3	10.4	10.3	10.1	9.8	9.5	9.8	10.2	10.5	10.5
Juno	9.0	9.4	9.7	9.8	9.9	9.8	10.2	10.4	10.4	10.2
Vesta	7.8	7.7	8.0	8.1	8.0	7.6	7.1	6.4	6.9	7.7

CONFIGURATIONS OF SUN, MOON AND PLANETS

	d	h		d	h	
Jan.	1	04	Mars 3° N. of Moon	Mar.	11	16 Mercury in superior conjunction
	2	00	Earth at perihelion		14	19 Aldebaran 0°5 S. of Moon Occn.
	2	01	Mercury in inferior conjunction		16	00 FIRST QUARTER
	2	02	LAST QUARTER		17	08 Mars at opposition
	7	17	Venus 5° S. of Moon		20	14 Equinox
	9	04	NEW MOON		20	17 Mars closest approach
	10	09	Moon at perigee		21	00 Moon at apogee
	12	14	Mercury 3° N. of Venus		23	14 Mars 4° N. of Moon
	12	21	Mercury stationary		24	05 FULL MOON Eclipse
	14	05	Saturn 2° S. of Moon		30	22 Saturn in conjunction with Sun
	14	07	Ceres in conjunction with Sun		31	20 LAST QUARTER
	15	20	FIRST QUARTER	Apr.	2	05 Neptune 4° S. of Moon
	17	13	Neptune in conjunction with Sun		2	14 Venus in superior conjunction
	19	06	Aldebaran 0°7 S. of Moon Occn.		2	19 Uranus 5° S. of Moon
	19	13	Jupiter in conjunction with Sun		3	08 Jupiter 4° S. of Moon
	23	15	FULL MOON		5	17 Moon at perigee
	24	05	Mercury greatest elong. W. (25°)		6	01 Mercury greatest elong. E. (19°)
	24	14	Uranus in conjunction with Sun		7	11 NEW MOON
	25	17	Moon at apogee		8	16 Mercury 6° N. of Moon
	28	23	Mars 3° N. of Moon		11	04 Aldebaran 0°5 S. of Moon Occn.
	31	20	LAST QUARTER		14	17 FIRST QUARTER
Feb.	1	11	Venus 1°0 S. of Neptune		15	05 Mercury stationary
	3	06	Vesta in conjunction with Sun		17	15 Moon at apogee
	6	00	Venus 0°3 S. of Jupiter		19	06 Mars 4° N. of Moon
	6	04	Mercury 5° S. of Moon		22	21 FULL MOON
	6	08	Neptune 4° S. of Moon		25	11 Mercury in inferior conjunction
	6	18	Mars stationary		29	06 Mars stationary
	7	12	Venus 0°2 S. of Uranus		29	11 Neptune 4° S. of Moon
	7	15	NEW MOON		30	03 LAST QUARTER
	7	20	Mercury 1°4 S. of Neptune		30	03 Uranus 5° S. of Moon
	7	21	Moon at perigee		30	21 Jupiter 4° S. of Moon
	10	17	Saturn 1°8 S. of Moon	May	1	23 Neptune stationary
	12	14	Mercury 1°0 S. of Jupiter		3	11 Moon at perigee
	13	00	Mercury 0°9 S. of Uranus		4	16 Saturn 0°8 S. of Moon Occn.
	14	09	FIRST QUARTER		5	16 Mercury 1°2 N. of Moon Occn.
	15	11	Aldebaran 0°6 S. of Moon Occn.		6	21 NEW MOON
	16	08	Jupiter 0°2 N. of Uranus		7	18 Mercury stationary
	21	17	Moon at apogee		8	14 Aldebaran 0°6 S. of Moon Occn.
	22	10	FULL MOON		13	09 Uranus stationary
	25	01	Mars 3° N. of Moon		14	11 FIRST QUARTER
Mar.	2	10	LAST QUARTER		15	10 Moon at apogee
	5	20	Neptune 4° S. of Moon		16	12 Pallas stationary
	6	09	Uranus 5° S. of Moon		16	16 Mars 2° N. of Moon
	6	14	Jupiter 5° S. of Moon		19	08 Venus 6° N. of Aldebaran
	8	09	Moon at perigee		22	09 FULL MOON
	9	01	NEW MOON Eclipse		22	23 Mercury greatest elong. W. (25°)
	10	06	Pluto stationary		25	10 Pluto at opposition
	10	09	Saturn 1°4 S. of Moon		26	16 Neptune 4° S. of Moon

CONFIGURATIONS OF SUN, MOON AND PLANETS

	d	h					d	h				
May	27	08	Uranus 4° S. of Moon				Aug.	4	00	Mercury greatest elong. E. (27°)		
	28	06	Jupiter 4° S. of Moon					5	19	Mercury 1°0 S. of Moon	Occn.	
	29	07	Moon at perigee					6	09	Venus 1°6 N. of Moon		
	29	08	LAST QUARTER					6	14	Moon at apogee		
June	1	03	Saturn 0°5 S. of Moon	Occn.				9	14	Jupiter at opposition		
	3	13	Mercury 1°6 N. of Moon					9	15	Mars 4° S. of Moon		
	5	07	NEW MOON					11	13	FIRST QUARTER		
	6	17	Venus 6° N. of Moon					16	05	Pluto stationary		
	10	11	Jupiter stationary					16	16	Neptune 4° S. of Moon		
	12	05	Moon at apogee					17	03	Mercury stationary		
	13	05	FIRST QUARTER					17	05	Uranus 4° S. of Moon		
	13	16	Mars 0°3 N. of Moon	Occn.				17	22	Jupiter 4° S. of Moon		
	14	14	Mercury 5° N. of Aldebaran					18	11	FULL MOON		
	20	19	FULL MOON					19	05	Moon at perigee		
	21	08	Solstice					22	02	Saturn 0°008 N. of Moon	Occn.	
	22	22	Neptune 4° S. of Moon					25	02	LAST QUARTER		
	23	13	Uranus 4° S. of Moon					25	17	Aldebaran 0°3 S. of Moon	Occn.	
	23	23	Venus 5° S. of Pollux					30	03	Ceres at opposition		
	24	05	Moon at perigee					31	14	Mercury in inferior conjunction		
	24	12	Jupiter 4° S. of Moon				Sept.	1	07	Vesta stationary		
	25	19	Mercury in superior conjunction					2	00	NEW MOON	Eclipse	
	27	13	LAST QUARTER					2	21	Moon at apogee		
	28	12	Saturn 0°2 S. of Moon	Occn.				5	12	Venus 3° S. of Moon		
July	2	05	Aldebaran 0°6 S. of Moon	Occn.				6	05	Venus 1°9 N. of Spica		
	4	19	Earth at aphelion					7	09	Mars 5° S. of Moon		
	4	19	NEW MOON					8	01	Pallas stationary		
	5	04	Mercury 5° S. of Pollux					9	06	Mercury stationary		
	7	02	Venus 5° N. of Moon					10	02	FIRST QUARTER		
	9	23	Moon at apogee					13	01	Neptune 4° S. of Moon		
	12	01	Mars 1°8 S. of Moon					13	14	Uranus 4° S. of Moon		
	12	22	FIRST QUARTER					14	04	Jupiter 4° S. of Moon		
	14	17	Ceres stationary					16	15	Moon at perigee		
	19	10	Pallas at opposition					16	19	FULL MOON	Eclipse	
	20	03	FULL MOON					16	22	Mercury greatest elong. W. (18°)		
	20	06	Neptune 4° S. of Moon					18	10	Saturn 0°2 S. of Moon	Occn.	
	20	21	Uranus 4° S. of Moon					22	00	Aldebaran 0°3 S. of Moon	Occn.	
	21	07	Neptune at opposition					23	00	Equinox		
	21	17	Jupiter 4° S. of Moon					23	14	LAST QUARTER		
	21	23	Moon at perigee					29	23	Moon at apogee		
	23	01	Venus 1°2 N. of Regulus				Oct.	1	17	NEW MOON		
	24	16	Juno in conjunction with Sun					5	13	Venus 7° S. of Moon		
	25	19	Saturn 0°02 N. of Moon	Occn.				6	06	Mars 6° S. of Moon		
	26	18	LAST QUARTER					8	07	Jupiter stationary		
	27	00	Mercury 0°5 S. of Regulus					8	22	Neptune stationary		
	29	11	Aldebaran 0°4 S. of Moon	Occn.				9	12	FIRST QUARTER		
	29	19	Uranus at opposition					10	04	Saturn at opposition		
Aug.	2	19	Saturn stationary					10	09	Neptune 4° S. of Moon		
	2	23	Mars 1°7 N. of Spica					10	22	Uranus 4° S. of Moon		
	3	08	NEW MOON					11	11	Jupiter 4° S. of Moon		

CONFIGURATIONS OF SUN, MOON AND PLANETS

	d	h					d	h				
Oct.	11	22	Mars 3° N. of Antares				Nov.	30	02	NEW MOON		
	13	21	Mercury in superior conjunction				Dec.	1	20	Mercury 7° S. of Moon		
	14	14	Uranus stationary					3	05	Mars 5° S. of Moon		
	15	02	Moon at perigee					3	17	Venus 7° S. of Moon		
	15	18	Saturn 0°4 S. of Moon	Occn.				3	22	Neptune 3° S. of Moon		
	16	04	FULL MOON					4	12	Uranus 4° S. of Moon		
	16	22	Venus 1°7 N. of Antares					5	08	Jupiter 3° S. of Moon		
	17	05	Vesta at opposition					6	18	Vesta stationary		
	19	09	Aldebaran 0°3 S. of Moon	Occn.				7	06	FIRST QUARTER		
	23	05	LAST QUARTER					7	16	Mercury stationary		
	24	21	Ceres stationary					7	20	Venus 3° S. of Neptune		
	26	23	Venus 2° S. of Mars					9	07	Saturn 0°2 S. of Moon	Occn.	
	27	09	Moon at apogee					9	17	Moon at perigee		
	31	10	NEW MOON					11	23	Venus greatest brilliancy		
Nov.	4	05	Mars 6° S. of Moon					13	05	Aldebaran 0°5 S. of Moon	Occn.	
	4	11	Venus 9° S. of Moon					14	03	FULL MOON		
	6	07	Venus greatest elong. E. (47°)					15	19	Mars 1°6 S. of Neptune		
	6	15	Neptune 4° S. of Moon					17	08	Mercury in inferior conjunction		
	7	05	Uranus 4° S. of Moon					17	11	Saturn stationary		
	7	20	Jupiter 4° S. of Moon					21	20	Solstice		
	7	22	FIRST QUARTER					21	22	LAST QUARTER		
	12	01	Saturn 0°4 S. of Moon	Occn.				21	23	Moon at apogee		
	12	08	Moon at perigee					22	11	Venus 1°1 N. of Mars		
	14	04	Mercury 2° N. of Antares					25	14	Venus stationary		
	14	14	FULL MOON					26	20	Mars 0°6 S. of Uranus		
	15	20	Aldebaran 0°5 S. of Moon	Occn.				27	13	Mercury stationary		
	22	00	LAST QUARTER					28	03	Mercury 2° S. of Moon		
	24	02	Moon at apogee					29	17	NEW MOON		
	27	17	Pluto in conjunction with Sun					31	06	Neptune 3° S. of Moon		
	28	16	Mercury greatest elong. E. (22°)					31	13	Venus 1°3 S. of Moon		
								31	21	Uranus 4° S. of Moon		

PREDICTED PERIHELION PASSAGES OF COMETS, 1997

Periodic comet	Perihelion		Period	Periodic comet	Perihelion		Period
	date	distance			date	distance	
		au	years			au	years
Shoemaker-Levy 4	Jan. 11	2.02	6.5	Grigg-Skjellerup	Aug. 30	1.00	5.1
Russell 4	Feb. 3	2.23	6.6	Wolf-Harrington	Sept 29	1.58	6.5
Holt-Olmstead	Feb. 6	2.15	6.3	Johnson	Oct. 31	2.31	7.0
Wirtanen	Mar. 14	1.06	5.5	Helin-Roman-Alu 2	Nov. 10	1.91	8.2
Helin-Roman-Alu 1	Mar. 27	3.72	9.6	du Toit-Hartley	Nov. 14	1.20	5.2
Boethin	Apr. 17	1.16	11.6	Russell 3	Nov. 19	2.51	7.5
Wild 2	May 6	1.58	6.4	Shoemaker-Holt 1	Nov. 21	3.05	9.5
Encke	May 23	0.33	3.3	Mueller 2	Nov. 22	2.41	7.1
Hartley 1	May 28	1.82	6.0	Taylor	Dec. 12	1.95	7.0
Gehrels 2	Aug. 7	2.00	7.2	Hartley 2	Dec. 21	1.03	6.4
Haneda-Campos	Aug. 15	1.27	6.4				

CHRONOLOGICAL CYCLES AND ERAS

Dominical Letter	... .. E	Julian Period (year of)	... .. 6710
Epact	... .. 21	Roman Indiction	... .. 5
Golden Number (Lunar Cycle)	... III	Solar Cycle	... .. 18

All dates are given in terms of the Gregorian calendar in which
1997 January 14 corresponds to 1997 January 1 of the Julian calendar.

ERA	YEAR	BEGINS	ERA	YEAR	BEGINS
Byzantine	7506 Sept. 14	Japanese	... ..	2657 Jan. 1
Jewish (A.M.)*	5758 Oct. 1	Grecian (Seleucidæ)	... ..	2309 Sept. 14
Chinese (Ding-chou)	(4634) Feb. 7			(or Oct. 14)
Roman (A.U.C.)	2750 Jan. 14	Indian (Saka)	... ..	1919 Mar. 22
Nabonassar	2746 Apr. 24	Diocletian	... ..	1714 Sept. 11
			Islamic (Hegira)*	... ..	1418 May 8

* Year begins at sunset

RELIGIOUS CALENDARS

Epiphany	... ..	Jan. 6	Ascension Day	... ..	May 8
Ash Wednesday	... ..	Feb. 12	Whit Sunday—Pentecost	... ..	May 18
Palm Sunday	... ..	Mar. 23	Trinity Sunday	... ..	May 25
Good Friday	... ..	Mar. 28	First Sunday in Advent	... ..	Nov. 30
Easter Day	... ..	Mar. 30	Christmas Day (Thursday)	... ..	Dec. 25
First Day of Passover (Pesach)	... ..	Apr. 22	Day of Atonement		
Feast of Weeks (Shavuot)	... ..	June 11	(Yom Kippur)	... ..	Oct. 11
Jewish New Year (tabular)			First day of Tabernacles		
(Rosh Hashanah)	... ..	Oct. 2	(Succoth)	... ..	Oct. 16
First day of Ramadân	... ..	Jan. 10	Islamic New Year	... ..	May 9
(tabular)	and	Dec 31	(tabular)		

The Jewish and Islamic dates above are tabular dates, which begin at sunset on the previous evening and end at sunset on the date tabulated. In practice, the dates of Islamic fasts and festivals are determined by an actual sighting of the appropriate new Moon.

CIVIL CALENDAR—UNITED STATES OF AMERICA

New Year's Day	... ..	Jan. 1	Labor Day	... ..	Sept. 1
Martin Luther King's Birthday	... ..	Jan. 20	Columbus Day	... ..	Oct. 13
Lincoln's Birthday	... ..	Feb. 12	Election Day (in certain States)	... ..	Nov. 4
Washington's Birthday	... ..	Feb. 17	Veterans Day	... ..	Nov. 11
Memorial Day	... ..	May 26	Thanksgiving Day	... ..	Nov. 27
Independence Day	... ..	July 4			

CIVIL CALENDAR—UNITED KINGDOM

Accession of Queen Elizabeth II	Feb. 6	Birthday of Prince Philip,	
St David (Wales)	... .. Mar. 1	Duke of Edinburgh	... .. June 10
Commonwealth Day	... .. Mar. 10	The Queen's Official Birthday†	June 14
St Patrick (Ireland)	... .. Mar. 17	Remembrance Sunday	... .. Nov. 9
Birthday of Queen Elizabeth II	Apr. 21	Birthday of the Prince of Wales	Nov. 14
St George (England)	... .. Apr. 23	St Andrew (Scotland)	... .. Nov. 30
Coronation Day	... .. June 2		

†Date subject to confirmation

	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE	
Day of Month	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year
1	Wed.	1	Sat.	32	Sat.	60	Tue.	91	Thu.	121	Sun.	152
2	Thu.	2	Sun.	33	Sun.	61	Wed.	92	Fri.	122	Mon.	153
3	Fri.	3	Mon.	34	Mon.	62	Thu.	93	Sat.	123	Tue.	154
4	Sat.	4	Tue.	35	Tue.	63	Fri.	94	Sun.	124	Wed.	155
5	Sun.	5	Wed.	36	Wed.	64	Sat.	95	Mon.	125	Thu.	156
6	Mon.	6	Thu.	37	Thu.	65	Sun.	96	Tue.	126	Fri.	157
7	Tue.	7	Fri.	38	Fri.	66	Mon.	97	Wed.	127	Sat.	158
8	Wed.	8	Sat.	39	Sat.	67	Tue.	98	Thu.	128	Sun.	159
9	Thu.	9	Sun.	40	Sun.	68	Wed.	99	Fri.	129	Mon.	160
10	Fri.	10	Mon.	41	Mon.	69	Thu.	100	Sat.	130	Tue.	161
11	Sat.	11	Tue.	42	Tue.	70	Fri.	101	Sun.	131	Wed.	162
12	Sun.	12	Wed.	43	Wed.	71	Sat.	102	Mon.	132	Thu.	163
13	Mon.	13	Thu.	44	Thu.	72	Sun.	103	Tue.	133	Fri.	164
14	Tue.	14	Fri.	45	Fri.	73	Mon.	104	Wed.	134	Sat.	165
15	Wed.	15	Sat.	46	Sat.	74	Tue.	105	Thu.	135	Sun.	166
16	Thu.	16	Sun.	47	Sun.	75	Wed.	106	Fri.	136	Mon.	167
17	Fri.	17	Mon.	48	Mon.	76	Thu.	107	Sat.	137	Tue.	168
18	Sat.	18	Tue.	49	Tue.	77	Fri.	108	Sun.	138	Wed.	169
19	Sun.	19	Wed.	50	Wed.	78	Sat.	109	Mon.	139	Thu.	170
20	Mon.	20	Thu.	51	Thu.	79	Sun.	110	Tue.	140	Fri.	171
21	Tue.	21	Fri.	52	Fri.	80	Mon.	111	Wed.	141	Sat.	172
22	Wed.	22	Sat.	53	Sat.	81	Tue.	112	Thu.	142	Sun.	173
23	Thu.	23	Sun.	54	Sun.	82	Wed.	113	Fri.	143	Mon.	174
24	Fri.	24	Mon.	55	Mon.	83	Thu.	114	Sat.	144	Tue.	175
25	Sat.	25	Tue.	56	Tue.	84	Fri.	115	Sun.	145	Wed.	176
26	Sun.	26	Wed.	57	Wed.	85	Sat.	116	Mon.	146	Thu.	177
27	Mon.	27	Thu.	58	Thu.	86	Sun.	117	Tue.	147	Fri.	178
28	Tue.	28	Fri.	59	Fri.	87	Mon.	118	Wed.	148	Sat.	179
29	Wed.	29			Sat.	88	Tue.	119	Thu.	149	Sun.	180
30	Thu.	30			Sun.	89	Wed.	120	Fri.	150	Mon.	181
31	Fri.	31			Mon.	90			Sat.	151		

JULIAN DATE, 1997

0 ^h UT	JD	0 ^h UT	JD	0 ^h UT	JD
Jan. 0	245 0448.5	May 0	245 0568.5	Sept. 0	245 0691.5
Feb. 0	245 0479.5	June 0	245 0599.5	Oct. 0	245 0721.5
Mar. 0	245 0507.5	July 0	245 0629.5	Nov. 0	245 0752.5
Apr. 0	245 0538.5	Aug. 0	245 0660.5	Dec. 0	245 0782.5

400-day date, JD 245 0800.5 = 1997 December 18.0

Standard epoch, 1900 January 0, 12^h UT = JD 241 5020.0
 Standard epoch, B1950.0 = 1950 Jan. 0.923 = JD 243 3282.423
 B1997.0 = 1997 Jan. 0.307 = JD 245 0448.807
 J1997.5 = 1997 July 2.375 = JD 245 0631.875
 Standard epoch, J2000.0 = 2000 Jan. 1.5 = JD 245 1545.0

	JULY			AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
Day of Month	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	Day of Week	Day of Year	
1	Tue.	182	Fri.	213	Mon.	244	Wed.	274	Sat.	305	Mon.	335	
2	Wed.	183	Sat.	214	Tue.	245	Thu.	275	Sun.	306	Tue.	336	
3	Thu.	184	Sun.	215	Wed.	246	Fri.	276	Mon.	307	Wed.	337	
4	Fri.	185	Mon.	216	Thu.	247	Sat.	277	Tue.	308	Thu.	338	
5	Sat.	186	Tue.	217	Fri.	248	Sun.	278	Wed.	309	Fri.	339	
6	Sun.	187	Wed.	218	Sat.	249	Mon.	279	Thu.	310	Sat.	340	
7	Mon.	188	Thu.	219	Sun.	250	Tue.	280	Fri.	311	Sun.	341	
8	Tue.	189	Fri.	220	Mon.	251	Wed.	281	Sat.	312	Mon.	342	
9	Wed.	190	Sat.	221	Tue.	252	Thu.	282	Sun.	313	Tue.	343	
10	Thu.	191	Sun.	222	Wed.	253	Fri.	283	Mon.	314	Wed.	344	
11	Fri.	192	Mon.	223	Thu.	254	Sat.	284	Tue.	315	Thu.	345	
12	Sat.	193	Tue.	224	Fri.	255	Sun.	285	Wed.	316	Fri.	346	
13	Sun.	194	Wed.	225	Sat.	256	Mon.	286	Thu.	317	Sat.	347	
14	Mon.	195	Thu.	226	Sun.	257	Tue.	287	Fri.	318	Sun.	348	
15	Tue.	196	Fri.	227	Mon.	258	Wed.	288	Sat.	319	Mon.	349	
16	Wed.	197	Sat.	228	Tue.	259	Thu.	289	Sun.	320	Tue.	350	
17	Thu.	198	Sun.	229	Wed.	260	Fri.	290	Mon.	321	Wed.	351	
18	Fri.	199	Mon.	230	Thu.	261	Sat.	291	Tue.	322	Thu.	352	
19	Sat.	200	Tue.	231	Fri.	262	Sun.	292	Wed.	323	Fri.	353	
20	Sun.	201	Wed.	232	Sat.	263	Mon.	293	Thu.	324	Sat.	354	
21	Mon.	202	Thu.	233	Sun.	264	Tue.	294	Fri.	325	Sun.	355	
22	Tue.	203	Fri.	234	Mon.	265	Wed.	295	Sat.	326	Mon.	356	
23	Wed.	204	Sat.	235	Tue.	266	Thu.	296	Sun.	327	Tue.	357	
24	Thu.	205	Sun.	236	Wed.	267	Fri.	297	Mon.	328	Wed.	358	
25	Fri.	206	Mon.	237	Thu.	268	Sat.	298	Tue.	329	Thu.	359	
26	Sat.	207	Tue.	238	Fri.	269	Sun.	299	Wed.	330	Fri.	360	
27	Sun.	208	Wed.	239	Sat.	270	Mon.	300	Thu.	331	Sat.	361	
28	Mon.	209	Thu.	240	Sun.	271	Tue.	301	Fri.	332	Sun.	362	
29	Tue.	210	Fri.	241	Mon.	272	Wed.	302	Sat.	333	Mon.	363	
30	Wed.	211	Sat.	242	Tue.	273	Thu.	303	Sun.	334	Tue.	364	
31	Thu.	212	Sun.	243			Fri.	304			Wed.	365	

MEAN SIDEREAL TIME, 1997

Greenwich mean sidereal time at 0^h UT

Jan. 0	^h 6:466	Apr. 0	^h 12:5604	July 0	^h 18:5400	Oct. 0	^h 0:5853
Feb. 0	8:6836	May 0	14:5317	Aug. 0	20:5770	Nov. 0	2:6223
Mar. 0	10:5234	June 0	16:5687	Sept. 0	22:6140	Dec. 0	4:5936

Greenwich mean sidereal time (GMST) on day d of month at hour t UT

$$= \text{GMST at } 0^{\text{h}} \text{ UT on day } 0 + 0^{\text{h}}065\,71\,d + 1^{\text{h}}002\,74\,t$$

$$\text{Local mean sidereal time} = \text{GMST} \begin{matrix} + \text{east} \\ - \text{west} \end{matrix} \text{ longitude}$$

AT 0 ^h UNIVERSAL TIME											
Date	Equation of time	Declin- ation	Date	Equation of time	Declin- ation	Date	Equation of time	Declin- ation	Date	Equation of time	Declin- ation
Jan. 0	^m −02 ^s 56	−23° 05′	Feb. 15	^m −14 ^s 11	−12° 44′	Apr. 1	^m −04 ^s 00	+04° 28′	May 17	^m +03 ^s 39	+19° 17′
1	03 25	23 01	16	14 08	12 23	2	03 42	04 51	18	03 37	19 31
2	03 53	22 56	17	14 04	12 02	3	03 25	05 14	19	03 34	19 44
3	04 21	22 50	18	13 59	11 41	4	03 07	05 37	20	03 32	19 56
4	04 48	22 44	19	13 54	11 20	5	02 50	06 00	21	03 28	20 09
5	−05 15	−22 38	20	−13 48	−10 59	6	−02 33	+06 23	22	+03 24	+20 21
6	05 42	22 31	21	13 41	10 37	7	02 16	06 46	23	03 20	20 33
7	06 09	22 23	22	13 34	10 15	8	01 59	07 08	24	03 15	20 44
8	06 34	22 16	23	13 26	09 53	9	01 43	07 31	25	03 09	20 55
9	07 00	22 07	24	13 18	09 31	10	01 26	07 53	26	03 03	21 06
10	−07 24	−21 59	25	−13 08	−09 09	11	−01 10	+08 15	27	+02 57	+21 16
11	07 49	21 50	26	12 59	08 47	12	00 55	08 37	28	02 50	21 26
12	08 12	21 40	27	12 49	08 24	13	00 39	08 59	29	02 42	21 35
13	08 35	21 30	28	12 38	08 02	14	00 24	09 21	30	02 34	21 44
14	08 58	21 20	Mar. 1	12 26	07 39	15	−00 09	09 42	31	02 26	21 53
15	−09 19	−21 09	2	−12 15	−07 16	16	+00 05	+10 04	June 1	+02 17	+22 02
16	09 40	20 58	3	12 02	06 53	17	00 20	10 25	2	02 08	22 10
17	10 01	20 46	4	11 50	06 30	18	00 33	10 46	3	01 58	22 17
18	10 20	20 34	5	11 36	06 07	19	00 47	11 07	4	01 48	22 25
19	10 39	20 22	6	11 23	05 44	20	01 00	11 27	5	01 37	22 31
20	−10 57	−20 09	7	−11 09	−05 21	21	+01 12	+11 48	6	+01 27	+22 38
21	11 14	19 56	8	10 55	04 57	22	01 24	12 08	7	01 16	22 44
22	11 31	19 43	9	10 40	04 34	23	01 36	12 28	8	01 04	22 50
23	11 47	19 29	10	10 25	04 10	24	01 47	12 48	9	00 53	22 55
24	12 02	19 15	11	10 09	03 47	25	01 58	13 08	10	00 41	23 00
25	−12 16	−19 00	12	−09 54	−03 23	26	+02 09	+13 27	11	+00 29	+23 04
26	12 29	18 45	13	09 37	03 00	27	02 18	13 47	12	00 17	23 08
27	12 42	18 30	14	09 21	02 36	28	02 28	14 06	13	+00 04	23 12
28	12 54	18 14	15	09 04	02 12	29	02 36	14 24	14	−00 08	23 15
29	13 05	17 58	16	08 48	01 49	30	02 45	14 43	15	00 21	23 18
30	−13 15	−17 42	17	−08 30	−01 25	May 1	+02 52	+15 01	16	−00 34	+23 20
31	13 25	17 26	18	08 13	01 01	2	02 59	15 19	17	00 47	23 22
Feb. 1	13 33	17 09	19	07 55	00 37	3	03 06	15 37	18	01 00	23 24
2	13 41	16 52	20	07 38	−00 14	4	03 12	15 55	19	01 12	23 25
3	13 48	16 34	21	07 20	+00 10	5	03 17	16 12	20	01 25	23 26
4	−13 54	−16 16	22	−07 02	+00 34	6	+03 22	+16 29	21	−01 38	+23 26
5	14 00	15 58	23	06 44	00 57	7	03 27	16 46	22	01 51	23 26
6	14 04	15 40	24	06 26	01 21	8	03 30	17 02	23	02 04	23 26
7	14 08	15 21	25	06 07	01 45	9	03 33	17 18	24	02 17	23 25
8	14 11	15 03	26	05 49	02 08	10	03 36	17 34	25	02 30	23 23
9	−14 14	−14 43	27	−05 31	+02 32	11	+03 38	+17 50	26	−02 42	+23 22
10	14 15	14 24	28	05 13	02 55	12	03 40	18 05	27	02 55	23 20
11	14 16	14 05	29	04 54	03 18	13	03 40	18 20	28	03 07	23 17
12	14 16	13 45	30	04 36	03 42	14	03 41	18 35	29	03 20	23 14
13	14 15	13 25	31	04 18	04 05	15	03 41	18 49	30	03 32	23 11
14	−14 13	−13 04	Apr. 1	−04 00	+04 28	16	+03 40	+19 03	July 1	−03 43	+23 07
15	−14 11	−12 44	2	−03 42	+04 51	17	+03 39	+19 17	2	−03 55	+23 03

Equation of time = apparent time − mean time

AT 0^h UNIVERSAL TIME

Equation Declin-			Equation Declin-			Equation Declin-			Equation Declin-		
Date	of time	ation	Date	of time	ation	Date	of time	ation	Date	of time	ation
July	^m ^s [°] [']		Aug. 16	^m ^s [°] [']		Oct. 1	^m ^s [°] [']		Nov. 16	^m ^s [°] [']	
1	-03 43	+23 07	17	04 07	13 29	2	10 32	03 30	17	15 07	18 56
2	03 55	23 03	18	03 54	13 09	3	10 51	03 53	18	14 55	19 11
3	04 06	22 58	19	03 41	12 50	4	11 10	04 17	19	14 42	19 25
4	04 17	22 53	20	03 27	12 30	5	11 28	04 40	20	14 29	19 39
5	04 28	22 48									
6	-04 39	+22 42	21	-03 12	+12 10	6	+11 46	-05 03	21	+14 14	-19 52
7	04 49	22 36	22	02 57	11 50	7	12 03	05 26	22	13 59	20 05
8	04 58	22 30	23	02 42	11 30	8	12 20	05 49	23	13 43	20 18
9	05 07	22 23	24	02 26	11 10	9	12 37	06 12	24	13 26	20 30
10	05 16	22 15	25	02 10	10 49	10	12 53	06 34	25	13 09	20 42
11	-05 25	+22 08	26	-01 53	+10 29	11	+13 09	-06 57	26	+12 50	-20 54
12	05 33	21 59	27	01 36	10 08	12	13 24	07 20	27	12 31	21 05
13	05 40	21 51	28	01 19	09 47	13	13 39	07 42	28	12 11	21 16
14	05 47	21 42	29	01 01	09 25	14	13 54	08 05	29	11 50	21 27
15	05 53	21 33	30	00 43	09 04	15	14 08	08 27	30	11 29	21 37
16	-05 59	+21 23	31	-00 25	+08 42	16	+14 21	-08 49	Dec. 1	+11 07	-21 46
17	06 05	21 14	Sept. 1	-00 06	08 21	17	14 34	09 11	2	10 45	21 55
18	06 10	21 03	2	+00 13	07 59	18	14 46	09 33	3	10 21	22 04
19	06 14	20 53	3	00 32	07 37	19	14 57	09 55	4	09 57	22 13
20	06 18	20 42	4	00 51	07 15	20	15 08	10 16	5	09 33	22 20
21	-06 21	+20 30	5	+01 11	+06 53	21	+15 19	-10 38	6	+09 08	-22 28
22	06 24	20 19	6	01 31	06 30	22	15 28	10 59	7	08 43	22 35
23	06 26	20 07	7	01 51	06 08	23	15 37	11 20	8	08 17	22 42
24	06 27	19 54	8	02 12	05 46	24	15 45	11 41	9	07 50	22 48
25	06 28	19 41	9	02 33	05 23	25	15 53	12 02	10	07 23	22 54
26	-06 29	+19 28	10	+02 53	+05 00	26	+15 59	-12 23	11	+06 56	-22 59
27	06 28	19 15	11	03 14	04 38	27	16 05	12 43	12	06 29	23 04
28	06 28	19 01	12	03 36	04 15	28	16 11	13 03	13	06 01	23 08
29	06 26	18 47	13	03 57	03 52	29	16 15	13 23	14	05 32	23 12
30	06 24	18 33	14	04 18	03 29	30	16 19	13 43	15	05 04	23 15
31	-06 22	+18 19	15	+04 39	+03 06	31	+16 22	-14 03	16	+04 35	-23 18
Aug. 1	06 19	18 04	16	05 01	02 43	Nov. 1	16 24	14 22	17	04 06	23 21
2	06 15	17 48	17	05 22	02 20	2	16 25	14 41	18	03 37	23 23
3	06 11	17 33	18	05 44	01 56	3	16 26	15 00	19	03 07	23 24
4	06 06	17 17	19	06 05	01 33	4	16 25	15 19	20	02 37	23 25
5	-06 00	+17 01	20	+06 27	+01 10	5	+16 24	-15 37	21	+02 08	-23 26
6	05 54	16 45	21	06 48	00 47	6	16 22	15 55	22	01 38	23 26
7	05 47	16 28	22	07 09	+00 23	7	16 20	16 13	23	01 08	23 26
8	05 40	16 11	23	07 30	00 00	8	16 16	16 31	24	00 38	23 25
9	05 32	15 54	24	07 51	-00 23	9	16 12	16 48	25	+00 08	23 24
10	-05 23	+15 37	25	+08 12	-00 47	10	+16 07	-17 05	26	-00 22	-23 22
11	05 14	15 19	26	08 33	01 10	11	16 01	17 22	27	00 51	23 20
12	05 05	15 01	27	08 53	01 34	12	15 54	17 38	28	01 21	23 17
13	04 54	14 43	28	09 14	01 57	13	15 46	17 55	29	01 50	23 14
14	04 43	14 25	29	09 34	02 20	14	15 38	18 10	30	02 19	23 11
15	-04 32	+14 06	30	+09 53	-02 44	15	+15 28	-18 26	31	-02 48	-23 06
16	-04 20	+13 48	Oct. 1	+10 13	-03 07	16	+15 18	-18 41	32	-03 17	-23 02

UT of transit = 12^{h} $\frac{\text{east}}{+ \text{west}}$ longitude - equation of time

AT 0^h UNIVERSAL TIME

Date	Polaris GHA	σ Oct GHA	Date	Polaris GHA	σ Oct GHA	Date	Polaris GHA	σ Oct GHA	Date	Polaris GHA	σ Oct GHA
Jan. 0	62° 11'	143° 32'	Feb. 15	107° 50'	188° 53'	Apr. 1	152° 25'	233° 05'	May 17	197° 45'	278° 11'
1	63° 11'	144° 31'	16	108° 49'	189° 52'	2	153° 24'	234° 04'	18	198° 44'	279° 10'
2	64° 10'	145° 31'	17	109° 49'	190° 51'	3	154° 23'	235° 03'	19	199° 43'	280° 09'
3	65° 10'	146° 30'	18	110° 48'	191° 50'	4	155° 23'	236° 02'	20	200° 42'	281° 07'
4	66° 09'	147° 29'	19	111° 48'	192° 49'	5	156° 22'	237° 00'	21	201° 40'	282° 06'
5	67° 08'	148° 29'	20	112° 47'	193° 48'	6	157° 21'	237° 59'	22	202° 39'	283° 05'
6	68° 08'	149° 28'	21	113° 47'	194° 47'	7	158° 21'	238° 58'	23	203° 38'	284° 04'
7	69° 07'	150° 27'	22	114° 46'	195° 46'	8	159° 20'	239° 57'	24	204° 37'	285° 03'
8	70° 07'	151° 26'	23	115° 46'	196° 45'	9	160° 19'	240° 56'	25	205° 36'	286° 02'
9	71° 06'	152° 25'	24	116° 46'	197° 44'	10	161° 18'	241° 55'	26	206° 35'	287° 00'
10	72° 06'	153° 25'	25	117° 45'	198° 43'	11	162° 17'	242° 54'	27	207° 34'	287° 59'
11	73° 05'	154° 24'	26	118° 45'	199° 42'	12	163° 17'	243° 52'	28	208° 33'	288° 58'
12	74° 05'	155° 23'	27	119° 44'	200° 41'	13	164° 16'	244° 51'	29	209° 32'	289° 57'
13	75° 05'	156° 22'	28	120° 44'	201° 40'	14	165° 15'	245° 50'	30	210° 31'	290° 56'
14	76° 04'	157° 21'	Mar. 1	121° 43'	202° 39'	15	166° 14'	246° 49'	31	211° 29'	291° 55'
15	77° 04'	158° 21'	2	122° 42'	203° 38'	16	167° 13'	247° 48'	June 1	212° 28'	292° 53'
16	78° 03'	159° 20'	3	123° 42'	204° 37'	17	168° 13'	248° 46'	2	213° 27'	293° 52'
17	79° 03'	160° 19'	4	124° 41'	205° 36'	18	169° 12'	249° 45'	3	214° 26'	294° 51'
18	80° 02'	161° 18'	5	125° 41'	206° 35'	19	170° 11'	250° 44'	4	215° 25'	295° 50'
19	81° 02'	162° 17'	6	126° 40'	207° 34'	20	171° 10'	251° 43'	5	216° 24'	296° 49'
20	82° 01'	163° 17'	7	127° 40'	208° 33'	21	172° 09'	252° 42'	6	217° 22'	297° 48'
21	83° 01'	164° 16'	8	128° 39'	209° 31'	22	173° 09'	253° 41'	7	218° 21'	298° 46'
22	84° 00'	165° 15'	9	129° 39'	210° 30'	23	174° 08'	254° 39'	8	219° 20'	299° 45'
23	85° 00'	166° 14'	10	130° 38'	211° 29'	24	175° 07'	255° 38'	9	220° 19'	300° 44'
24	85° 59'	167° 13'	11	131° 38'	212° 28'	25	176° 06'	256° 37'	10	221° 18'	301° 43'
25	86° 59'	168° 12'	12	132° 37'	213° 27'	26	177° 05'	257° 36'	11	222° 17'	302° 42'
26	87° 59'	169° 11'	13	133° 37'	214° 26'	27	178° 04'	258° 35'	12	223° 15'	303° 41'
27	88° 58'	170° 10'	14	134° 36'	215° 25'	28	179° 03'	259° 34'	13	224° 14'	304° 40'
28	89° 58'	171° 10'	15	135° 35'	216° 24'	29	180° 02'	260° 32'	14	225° 13'	305° 38'
29	90° 57'	172° 09'	16	136° 35'	217° 23'	30	181° 01'	261° 31'	15	226° 12'	306° 37'
30	91° 57'	173° 08'	17	137° 34'	218° 22'	May 1	182° 00'	262° 30'	16	227° 11'	307° 36'
31	92° 56'	174° 07'	18	138° 34'	219° 21'	2	182° 59'	263° 29'	17	228° 10'	308° 35'
Feb. 1	93° 56'	175° 06'	19	139° 33'	220° 20'	3	183° 59'	264° 28'	18	229° 08'	309° 34'
2	94° 55'	176° 05'	20	140° 32'	221° 18'	4	184° 58'	265° 26'	19	230° 07'	310° 33'
3	95° 55'	177° 04'	21	141° 32'	222° 17'	5	185° 57'	266° 25'	20	231° 06'	311° 32'
4	96° 55'	178° 03'	22	142° 31'	223° 16'	6	186° 56'	267° 24'	21	232° 05'	312° 31'
5	97° 54'	179° 02'	23	143° 31'	224° 15'	7	187° 55'	268° 23'	22	233° 03'	313° 29'
6	98° 54'	180° 02'	24	144° 30'	225° 14'	8	188° 54'	269° 22'	23	234° 02'	314° 28'
7	99° 53'	181° 01'	25	145° 29'	226° 13'	9	189° 53'	270° 21'	24	235° 01'	315° 27'
8	100° 53'	182° 00'	26	146° 29'	227° 12'	10	190° 52'	271° 19'	25	236° 00'	316° 26'
9	101° 52'	182° 59'	27	147° 28'	228° 11'	11	191° 51'	272° 18'	26	236° 58'	317° 25'
10	102° 52'	183° 58'	28	148° 27'	229° 10'	12	192° 50'	273° 17'	27	237° 57'	318° 24'
11	103° 52'	184° 57'	29	149° 27'	230° 08'	13	193° 49'	274° 16'	28	238° 56'	319° 23'
12	104° 51'	185° 56'	30	150° 26'	231° 07'	14	194° 48'	275° 15'	29	239° 55'	320° 22'
13	105° 51'	186° 55'	31	151° 25'	232° 06'	15	195° 47'	276° 13'	30	240° 53'	321° 21'
14	106° 50'	187° 54'	Apr. 1	152° 25'	233° 05'	16	196° 46'	277° 12'	July 1	241° 52'	322° 20'
15	107° 50'	188° 53'	2	153° 24'	234° 04'	17	197° 45'	278° 11'	2	242° 51'	323° 19'

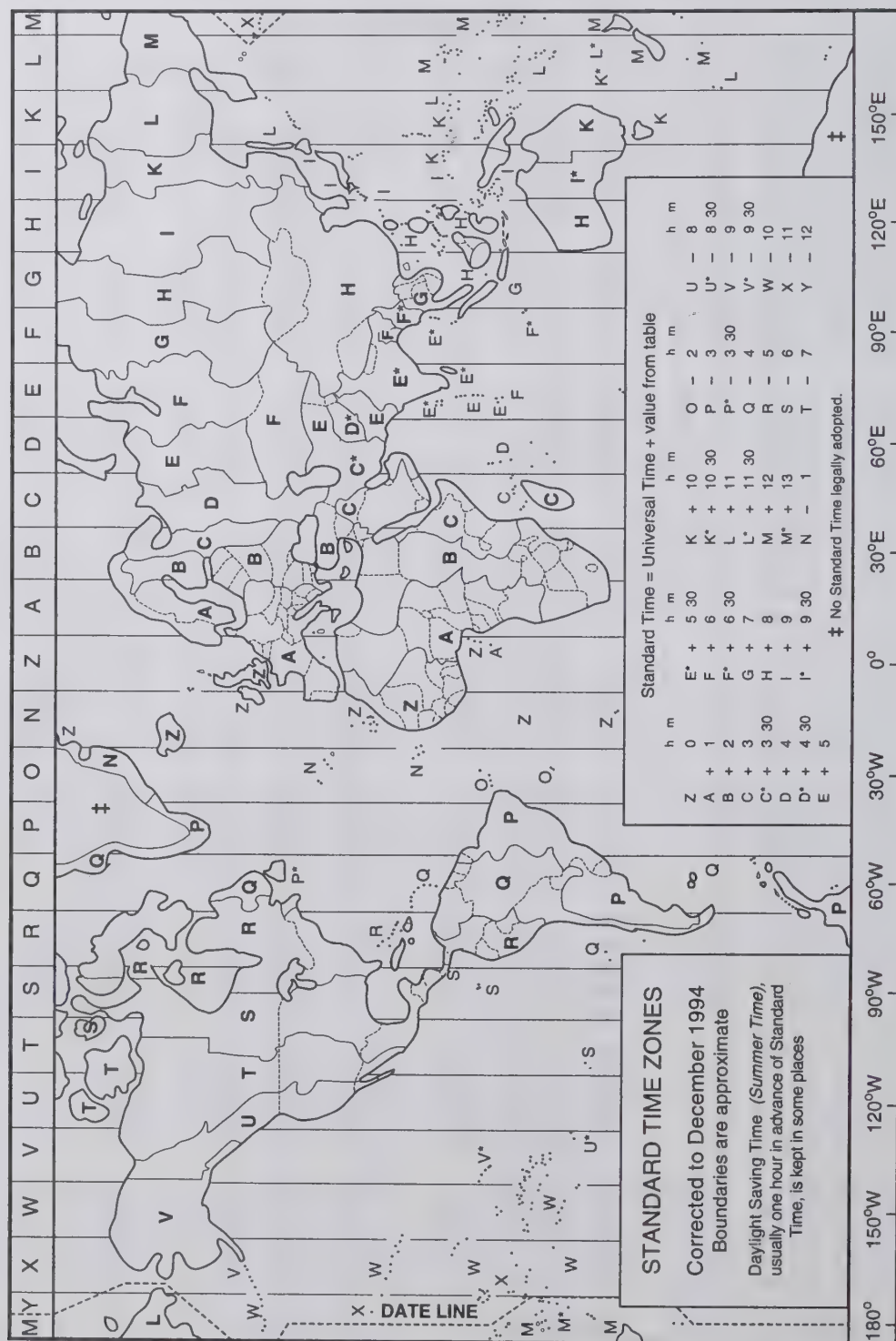
The dates between Jan. 0 and Dec. 32 below are the dates when p changes to the next value.

Polar Distance (p) *Polaris*: Jan. 0 45' Dec. 32
 σ Octantis: Jan. 0 62' Dec. 32

AT 0^h UNIVERSAL TIME

Polaris			σ Oct	Polaris			σ Oct	Polaris			σ Oct	Polaris			σ Oct
Date	GHA	GHA	Date	GHA	GHA	Date	GHA	GHA	Date	GHA	GHA	Date	GHA	GHA	
July	1	241 52	322 20	Aug. 16	286 53	7 35	Oct. 1	331 57	53 01	Nov. 16	17 12	98 34			
	2	242 51	323 19		17	287 52		8 34	2		332 56	54 00	17	18 11	99 34
	3	243 50	324 17		18	288 50		9 33	3		333 55	55 00	18	19 10	100 33
	4	244 48	325 16		19	289 49		10 32	4		334 54	55 59	19	20 10	101 32
	5	245 47	326 15		20	290 48		11 31	5		335 53	56 58	20	21 09	102 32
	6	246 46	327 14		21	291 47		12 30	6		336 52	57 58	21	22 08	103 31
	7	247 44	328 13		22	292 45		13 30	7		337 51	58 57	22	23 07	104 30
	8	248 43	329 12		23	293 44		14 29	8		338 49	59 57	23	24 07	105 30
	9	249 42	330 11		24	294 43		15 28	9		339 48	60 56	24	25 06	106 29
	10	250 41	331 10		25	295 42		16 27	10		340 47	61 55	25	26 05	107 29
	11	251 40	332 09		26	296 40		17 26	11		341 46	62 55	26	27 04	108 28
	12	252 38	333 08		27	297 39		18 26	12		342 45	63 54	27	28 04	109 28
	13	253 37	334 07		28	298 38		19 25	13		343 44	64 53	28	29 03	110 27
	14	254 36	335 06		29	299 36		20 24	14		344 43	65 53	29	30 02	111 27
	15	255 34	336 05		30	300 35		21 23	15		345 42	66 52	30	31 01	112 26
16	256 33	337 04	Sept. 1	301 34	22 22	16	346 41	67 52	Dec. 1	32 01	113 25				
17	257 32	338 03		2	302 33	23 22	17	347 40		68 51	2	33 00	114 25		
18	258 30	339 02		3	303 32	24 21	18	348 39		69 51	3	33 59	115 24		
19	259 29	340 01		4	304 30	25 20	19	349 38		70 50	4	34 58	116 23		
20	260 28	341 00		5	305 29	26 19	20	350 37		71 49	5	35 58	117 23		
21	261 27	341 59		6	306 28	27 19	21	351 36		72 49	6	36 57	118 22		
22	262 25	342 58		7	307 27	28 18	22	352 35		73 48	7	37 57	119 22		
23	263 24	343 57		8	308 26	29 17	23	353 34		74 48	8	38 56	120 21		
24	264 23	344 56		9	309 24	30 16	24	354 33		75 47	9	39 55	121 20		
25	265 22	345 55		10	310 23	31 16	25	355 32		76 46	10	40 55	122 20		
26	266 20	346 54		11	311 22	32 15	26	356 31		77 46	11	41 54	123 19		
27	267 19	347 53		12	312 21	33 14	27	357 30		78 45	12	42 53	124 18		
28	268 18	348 52		13	313 19	34 14	28	358 29		79 45	13	43 53	125 18		
29	269 16	349 51		14	314 18	35 13	29	359 28		80 44	14	44 52	126 17		
30	270 15	350 50		15	315 17	36 12	30	0 27		81 44	15	45 51	127 17		
Aug.	31	271 14	351 49	16	316 16	37 11	Nov. 1	1 26	82 43	16	46 51	128 16			
	1	272 12	352 48	17	317 15	38 11		2	2 25		83 43	17	47 50	129 15	
	2	273 11	353 47	18	318 13	39 10		3	3 24		84 42	18	48 49	130 14	
	3	274 10	354 46	19	319 12	40 09		4	4 23		85 42	19	49 49	131 14	
	4	275 08	355 45	20	320 11	41 09		5	5 23		86 41	20	50 48	132 13	
	5	276 07	356 44	21	321 10	42 08		6	6 22		87 40	21	51 48	133 12	
	6	277 06	357 43	22	322 09	43 07		7	7 21		88 40	22	52 47	134 12	
	7	278 05	358 43	23	323 07	44 07		8	8 20		89 39	23	53 47	135 11	
	8	279 03	359 42	24	324 06	45 06		9	9 19		90 39	24	54 46	136 10	
	9	280 02	0 41	25	325 05	46 05		10	10 18		91 38	25	55 46	137 10	
	10	281 01	1 40	26	326 04	47 05		11	11 17		92 37	26	56 45	138 09	
	11	282 00	2 39	27	327 03	48 04		12	12 17		93 37	27	57 44	139 08	
	12	282 58	3 38	28	328 02	49 03		13	13 16		94 36	28	58 44	140 08	
	13	283 57	4 37	29	329 01	50 03		14	14 15		95 36	29	59 43	141 07	
	14	284 56	5 36	30	329 59	51 02		15	15 14		96 35	30	60 43	142 06	
	15	285 54	6 36	Oct. 1	330 58	52 01		16	16 13		97 35	31	61 42	143 05	
16	286 53	7 35	1		331 57	53 01	17	17 12	98 34	32	62 42	144 05			

Form the quantities $C = p \cos(\text{local hour angle})$ and $S = p \sin(\text{local hour angle})$, then
Latitude = $h_0 - C + 0.0087 S^2 \tan h_0$,
Azimuth of *Polaris* = $-S / \cos h_0$ and Azimuth of σ Octantis = $180^\circ + S / \cos h_0$, where p and h_0
are in degrees and h_0 is the observed altitude corrected for atmospheric refraction and instrument error.



The times of sunrise and sunset (pages 24–31) and of moonrise and moonset (pages 32–63) are the instants when the upper limbs of the Sun and Moon appear to lie on the horizon for an observer at sea-level. In both cases a fixed allowance of 34' has been made for refraction; a further allowance of 16' has been made for the semidiameter of the Sun, while for the Moon the actual value of semidiameter *minus* horizontal parallax has been used. No allowance has been made for the phase of the Moon. The observed times may differ from the tabular times because of variations in refraction and the relative heights of the observer and horizon.

The tabular values are for the universal time (UT) of the phenomena on the Greenwich meridian (longitude 0°). To a first approximation the UT at another longitude is given by subtracting the longitude, expressed in time-measure, if east of Greenwich, or by adding, if west of Greenwich. Alternatively the tables may be regarded as giving the approximate local mean time on all meridians. These times may be converted to standard time by applying the appropriate differences, as indicated in the note on page 4. Linear interpolation may be used to obtain the times for non-tabular latitudes.

In the case of the Sun it may be necessary to interpolate (mentally) to obtain the UT for an intermediate date, but a further interpolation for longitude is not normally required. In the case of the Moon the values must normally be interpolated for longitude, as well as for latitude, since the changes in the tabular values from one day to the next are usually large. The interpolating factor is equal to one twenty-fourth of the longitude if expressed in hours and decimals of an hour; linear interpolation is usually adequate.

Example

To find the times of sunrise and sunset and of moonrise and moonset on 1997 February 4 at latitude N 38° 55', longitude W 77° 15'. The longitude expressed in time-measure is W 05^h 09^m. The difference between standard time and UT is –5^h in this case.

The relevant tabular values in UT for longitude 0° are as follows:

		Sunrise		Sunset		Moonrise		Moonset	
		+35°	+40°	+35°	+40°	+35°	+40°	+35°	+40°
d	h m	h m	h m	h m	h m	d	h m	h m	h m
Feb. 3	06 57	07 07	17 31	17 22	Feb. 4	03 44	03 56	14 21	14 09
7	06 54	07 02	17 35	17 26	5	04 42	04 53	15 24	15 13

Interpolating factor for latitude is 3° 55' / 5° = 0.78
 for date for Sun is 1^d / 4^d = 0.25
 for long. for Moon is 5^h 15' / 24^h = 0.21

		Sunrise		Sunset	Moonrise		Moonset
		d	h m	h m	d	h m	h m
Interpolation to:							
Latitude N 38° 55'	Feb. 3	07 05	17 24	Feb. 4	03 53	14 12	
N 38° 55'	7	07 00	17 28	5	04 51	15 15	
Local mean time	4	07 04	17 25	4	04 05	14 25	
Adjustment to:							
Universal time	4	12 13	22 34	4	09 14	19 34	
Standard time	4	07 13	17 34	4	04 14	14 34	

SUNRISE AND SUNSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
SUNRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. -2	3 23	3 52	4 15	4 33	4 48	5 00	5 22	5 41	5 58	6 16	6 34	6 55	7 07	7 21
2	3 27	3 56	4 18	4 36	4 50	5 03	5 25	5 43	6 00	6 17	6 35	6 56	7 08	7 22
6	3 33	4 01	4 22	4 39	4 54	5 06	5 27	5 45	6 02	6 19	6 37	6 57	7 09	7 22
10	3 39	4 06	4 27	4 43	4 57	5 09	5 30	5 48	6 04	6 20	6 37	6 57	7 08	7 22
14	3 46	4 12	4 32	4 48	5 01	5 13	5 33	5 50	6 05	6 21	6 38	6 57	7 08	7 20
18	3 54	4 18	4 37	4 52	5 05	5 16	5 35	5 52	6 07	6 22	6 38	6 56	7 07	7 19
22	4 01	4 25	4 42	4 57	5 09	5 20	5 38	5 54	6 08	6 22	6 38	6 55	7 05	7 16
26	4 10	4 31	4 48	5 02	5 13	5 23	5 40	5 55	6 09	6 23	6 37	6 53	7 03	7 14
30	4 18	4 38	4 54	5 07	5 17	5 27	5 43	5 57	6 10	6 23	6 36	6 51	7 00	7 10
Feb. 3	4 27	4 45	5 00	5 12	5 22	5 30	5 45	5 58	6 10	6 22	6 35	6 49	6 57	7 07
7	4 36	4 52	5 06	5 16	5 26	5 34	5 48	6 00	6 11	6 22	6 33	6 46	6 54	7 02
11	4 44	4 59	5 11	5 21	5 30	5 37	5 50	6 01	6 11	6 21	6 31	6 43	6 50	6 58
15	4 53	5 07	5 17	5 26	5 34	5 40	5 52	6 02	6 11	6 20	6 29	6 40	6 46	6 53
19	5 02	5 14	5 23	5 31	5 38	5 44	5 54	6 02	6 10	6 18	6 27	6 36	6 42	6 48
23	5 10	5 20	5 29	5 36	5 41	5 47	5 55	6 03	6 10	6 17	6 24	6 32	6 37	6 42
27	5 19	5 27	5 34	5 40	5 45	5 49	5 57	6 03	6 09	6 15	6 21	6 28	6 32	6 36
Mar. 3	5 27	5 34	5 40	5 45	5 49	5 52	5 58	6 04	6 09	6 13	6 18	6 24	6 27	6 30
7	5 35	5 41	5 45	5 49	5 52	5 55	6 00	6 04	6 08	6 11	6 15	6 19	6 22	6 24
11	5 43	5 47	5 51	5 53	5 56	5 58	6 01	6 04	6 07	6 09	6 12	6 15	6 16	6 18
15	5 51	5 54	5 56	5 58	5 59	6 00	6 02	6 04	6 06	6 07	6 09	6 10	6 11	6 12
19	5 59	6 00	6 01	6 02	6 02	6 03	6 04	6 04	6 05	6 05	6 05	6 05	6 05	6 05
23	6 07	6 06	6 06	6 06	6 06	6 05	6 05	6 04	6 03	6 03	6 02	6 00	6 00	5 59
27	6 15	6 13	6 11	6 10	6 09	6 08	6 06	6 04	6 02	6 00	5 58	5 56	5 54	5 52
31	6 22	6 19	6 16	6 14	6 12	6 10	6 07	6 04	6 01	5 58	5 55	5 51	5 48	5 46
Apr. 4	6 30	6 25	6 21	6 18	6 15	6 12	6 08	6 04	6 00	5 56	5 51	5 46	5 43	5 39

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. -2	20 41	20 12	19 49	19 32	19 17	19 04	18 42	18 23	18 06	17 49	17 30	17 09	16 57	16 43
2	20 40	20 11	19 50	19 32	19 18	19 05	18 43	18 25	18 08	17 51	17 33	17 12	17 00	16 46
6	20 38	20 10	19 49	19 32	19 18	19 05	18 44	18 26	18 10	17 53	17 35	17 15	17 03	16 50
10	20 35	20 08	19 48	19 31	19 18	19 06	18 45	18 28	18 11	17 55	17 38	17 18	17 07	16 54
14	20 31	20 06	19 46	19 30	19 17	19 05	18 46	18 29	18 13	17 57	17 41	17 22	17 11	16 58
18	20 26	20 02	19 43	19 28	19 16	19 04	18 46	18 29	18 14	17 59	17 43	17 25	17 15	17 03
22	20 21	19 58	19 40	19 26	19 14	19 03	18 45	18 30	18 15	18 01	17 46	17 29	17 19	17 07
26	20 14	19 53	19 36	19 23	19 11	19 01	18 44	18 30	18 16	18 03	17 48	17 32	17 23	17 12
30	20 07	19 47	19 32	19 19	19 09	18 59	18 43	18 30	18 17	18 04	17 51	17 36	17 27	17 17
Feb. 3	19 59	19 41	19 27	19 16	19 06	18 57	18 42	18 29	18 17	18 06	17 53	17 39	17 31	17 22
7	19 51	19 35	19 22	19 11	19 02	18 54	18 40	18 29	18 18	18 07	17 55	17 42	17 35	17 26
11	19 43	19 28	19 16	19 06	18 58	18 51	18 38	18 28	18 18	18 08	17 57	17 46	17 39	17 31
15	19 34	19 21	19 10	19 01	18 54	18 47	18 36	18 27	18 18	18 09	17 59	17 49	17 43	17 36
19	19 25	19 13	19 04	18 56	18 49	18 44	18 34	18 25	18 17	18 09	18 01	17 52	17 47	17 41
23	19 15	19 05	18 57	18 50	18 45	18 40	18 31	18 24	18 17	18 10	18 03	17 55	17 50	17 45
27	19 06	18 57	18 50	18 45	18 40	18 35	18 28	18 22	18 16	18 10	18 04	17 58	17 54	17 50
Mar. 3	18 56	18 49	18 43	18 39	18 35	18 31	18 25	18 20	18 15	18 11	18 06	18 00	17 57	17 54
7	18 46	18 40	18 36	18 32	18 29	18 27	18 22	18 18	18 14	18 11	18 07	18 03	18 01	17 58
11	18 36	18 32	18 29	18 26	18 24	18 22	18 19	18 16	18 13	18 11	18 08	18 06	18 04	18 03
15	18 26	18 23	18 21	18 20	18 18	18 17	18 15	18 14	18 12	18 11	18 10	18 08	18 08	18 07
19	18 15	18 14	18 14	18 13	18 13	18 12	18 12	18 11	18 11	18 11	18 11	18 11	18 11	18 11
23	18 05	18 06	18 06	18 07	18 07	18 07	18 08	18 09	18 10	18 11	18 12	18 13	18 14	18 15
27	17 55	17 57	17 59	18 00	18 01	18 03	18 05	18 07	18 09	18 11	18 13	18 16	18 17	18 19
31	17 45	17 48	17 51	17 54	17 56	17 58	18 01	18 04	18 07	18 11	18 14	18 18	18 20	18 23
Apr. 4	17 35	17 40	17 44	17 47	17 50	17 53	17 58	18 02	18 06	18 10	18 15	18 20	18 24	18 27

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

SUNRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. —2	7 21	7 28	7 34	7 42	7 50	7 59	8 08	8 19	8 32	8 46	9 03	9 24	9 52	10 32
2	7 22	7 28	7 35	7 42	7 50	7 58	8 08	8 19	8 31	8 45	9 02	9 22	9 48	10 26
6	7 22	7 28	7 35	7 42	7 49	7 58	8 07	8 17	8 29	8 43	8 59	9 18	9 43	10 17
10	7 22	7 27	7 34	7 40	7 48	7 56	8 05	8 15	8 26	8 39	8 55	9 13	9 36	10 07
14	7 20	7 26	7 32	7 39	7 46	7 53	8 02	8 12	8 22	8 35	8 49	9 06	9 28	9 56
18	7 19	7 24	7 30	7 36	7 43	7 50	7 58	8 07	8 18	8 29	8 43	8 59	9 18	9 43
22	7 16	7 22	7 27	7 33	7 39	7 46	7 54	8 02	8 12	8 23	8 35	8 50	9 08	9 30
26	7 14	7 18	7 24	7 29	7 35	7 42	7 49	7 57	8 06	8 16	8 27	8 41	8 57	9 17
30	7 10	7 15	7 20	7 25	7 30	7 36	7 43	7 50	7 59	8 08	8 18	8 31	8 45	9 03
Feb. 3	7 07	7 11	7 15	7 20	7 25	7 31	7 37	7 43	7 51	7 59	8 09	8 20	8 33	8 49
7	7 02	7 06	7 10	7 15	7 19	7 24	7 30	7 36	7 43	7 50	7 59	8 09	8 21	8 35
11	6 58	7 01	7 05	7 09	7 13	7 18	7 23	7 28	7 34	7 41	7 49	7 58	8 08	8 20
15	6 53	6 56	6 59	7 03	7 07	7 11	7 15	7 20	7 25	7 31	7 38	7 46	7 55	8 05
19	6 48	6 50	6 53	6 56	7 00	7 03	7 07	7 11	7 16	7 21	7 27	7 34	7 41	7 50
23	6 42	6 45	6 47	6 50	6 52	6 55	6 59	7 02	7 06	7 11	7 16	7 21	7 28	7 36
27	6 36	6 38	6 40	6 43	6 45	6 47	6 50	6 53	6 57	7 00	7 04	7 09	7 14	7 20
Mar. 3	6 30	6 32	6 34	6 35	6 37	6 39	6 41	6 44	6 47	6 49	6 53	6 56	7 01	7 05
7	6 24	6 26	6 27	6 28	6 29	6 31	6 33	6 34	6 36	6 38	6 41	6 44	6 47	6 50
11	6 18	6 19	6 20	6 21	6 21	6 22	6 24	6 25	6 26	6 27	6 29	6 31	6 33	6 35
15	6 12	6 12	6 12	6 13	6 13	6 14	6 14	6 15	6 16	6 16	6 17	6 18	6 19	6 20
19	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 05	6 04
23	5 59	5 58	5 58	5 57	5 57	5 56	5 56	5 55	5 54	5 54	5 53	5 52	5 50	5 49
27	5 52	5 51	5 51	5 50	5 49	5 48	5 47	5 45	5 44	5 42	5 41	5 39	5 36	5 34
31	5 46	5 45	5 43	5 42	5 41	5 39	5 37	5 35	5 33	5 31	5 28	5 25	5 22	5 18
Apr. 4	5 39	5 38	5 36	5 34	5 32	5 30	5 28	5 26	5 23	5 20	5 16	5 12	5 08	5 03

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. —2	16 43	16 37	16 30	16 23	16 15	16 06	15 56	15 45	15 33	15 18	15 01	14 40	14 13	13 33
2	16 46	16 40	16 34	16 26	16 19	16 10	16 00	15 50	15 38	15 23	15 07	14 46	14 20	13 43
6	16 50	16 44	16 37	16 30	16 23	16 15	16 05	15 55	15 43	15 29	15 13	14 54	14 29	13 55
10	16 54	16 48	16 42	16 35	16 28	16 20	16 11	16 01	15 49	15 36	15 21	15 03	14 40	14 09
14	16 58	16 53	16 47	16 40	16 33	16 25	16 17	16 07	15 56	15 44	15 30	15 12	14 51	14 23
18	17 03	16 57	16 52	16 45	16 39	16 31	16 23	16 14	16 04	15 52	15 39	15 23	15 03	14 38
22	17 07	17 02	16 57	16 51	16 45	16 38	16 30	16 21	16 12	16 01	15 49	15 34	15 16	14 54
26	17 12	17 07	17 02	16 57	16 51	16 44	16 37	16 29	16 20	16 10	15 59	15 45	15 29	15 09
30	17 17	17 12	17 08	17 02	16 57	16 51	16 44	16 37	16 29	16 20	16 09	15 57	15 42	15 25
Feb. 3	17 22	17 17	17 13	17 08	17 03	16 58	16 52	16 45	16 38	16 29	16 20	16 09	15 55	15 40
7	17 26	17 23	17 19	17 14	17 10	17 05	16 59	16 53	16 46	16 39	16 30	16 20	16 09	15 55
11	17 31	17 28	17 24	17 20	17 16	17 12	17 07	17 01	16 55	16 48	16 41	16 32	16 22	16 10
15	17 36	17 33	17 30	17 26	17 22	17 18	17 14	17 09	17 04	16 58	16 51	16 44	16 35	16 24
19	17 41	17 38	17 35	17 32	17 29	17 25	17 21	17 17	17 13	17 07	17 02	16 55	16 47	16 39
23	17 45	17 43	17 40	17 38	17 35	17 32	17 29	17 25	17 21	17 17	17 12	17 06	17 00	16 53
27	17 50	17 48	17 46	17 44	17 41	17 39	17 36	17 33	17 30	17 26	17 22	17 18	17 12	17 06
Mar. 3	17 54	17 52	17 51	17 49	17 47	17 45	17 43	17 41	17 38	17 36	17 32	17 29	17 25	17 20
7	17 58	17 57	17 56	17 55	17 53	17 52	17 50	17 49	17 47	17 45	17 42	17 40	17 37	17 33
11	18 03	18 02	18 01	18 00	17 59	17 59	17 58	17 56	17 55	17 54	17 52	17 51	17 49	17 47
15	18 07	18 06	18 06	18 06	18 05	18 05	18 05	18 04	18 04	18 03	18 02	18 02	18 01	18 00
19	18 11	18 11	18 11	18 11	18 11	18 11	18 11	18 12	18 12	18 12	18 12	18 12	18 13	18 13
23	18 15	18 16	18 16	18 17	18 17	18 18	18 18	18 19	18 20	18 21	18 22	18 23	18 24	18 26
27	18 19	18 20	18 21	18 22	18 23	18 24	18 25	18 27	18 28	18 30	18 32	18 34	18 36	18 39
31	18 23	18 24	18 26	18 27	18 29	18 30	18 32	18 34	18 36	18 39	18 41	18 44	18 48	18 52
Apr. 4	18 27	18 29	18 31	18 32	18 34	18 37	18 39	18 41	18 44	18 48	18 51	18 55	19 00	19 05

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

SUNRISE

Lat.	−55°	−50°	−45°	−40°	−35°	−30°	−20°	−10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Mar. 31	6 22	6 19	6 16	6 14	6 12	6 10	6 07	6 04	6 01	5 58	5 55	5 51	5 48	5 46
Apr. 4	6 30	6 25	6 21	6 18	6 15	6 12	6 08	6 04	6 00	5 56	5 51	5 46	5 43	5 39
8	6 38	6 31	6 26	6 22	6 18	6 15	6 09	6 04	5 59	5 53	5 48	5 41	5 37	5 33
12	6 45	6 38	6 31	6 26	6 21	6 17	6 10	6 04	5 57	5 51	5 44	5 37	5 32	5 27
16	6 53	6 44	6 36	6 30	6 26	6 20	6 11	6 04	5 56	5 49	5 41	5 32	5 27	5 21
20	7 01	6 50	6 41	6 34	6 28	6 22	6 12	6 04	5 56	5 47	5 38	5 28	5 22	5 15
24	7 08	6 56	6 46	6 38	6 31	6 25	6 14	6 04	5 55	5 45	5 35	5 24	5 17	5 09
28	7 16	7 02	6 51	6 42	6 34	6 27	6 15	6 04	5 54	5 44	5 33	5 20	5 13	5 04
May 2	7 23	7 08	6 56	6 46	6 37	6 30	6 16	6 05	5 54	5 42	5 30	5 16	5 08	4 59
6	7 31	7 14	7 01	6 50	6 40	6 32	6 18	6 05	5 53	5 41	5 28	5 13	5 04	4 54
10	7 38	7 20	7 05	6 54	6 43	6 35	6 19	6 06	5 53	5 40	5 26	5 10	5 01	4 50
14	7 45	7 25	7 10	6 57	6 47	6 37	6 21	6 06	5 53	5 39	5 24	5 07	4 57	4 46
18	7 51	7 31	7 14	7 01	6 50	6 40	6 22	6 07	5 53	5 38	5 23	5 05	4 54	4 42
22	7 58	7 36	7 19	7 05	6 53	6 42	6 24	6 08	5 53	5 38	5 22	5 03	4 52	4 39
26	8 04	7 41	7 23	7 08	6 55	6 44	6 25	6 09	5 53	5 38	5 21	5 01	4 50	4 36
30	8 09	7 45	7 26	7 11	6 58	6 47	6 27	6 10	5 54	5 38	5 20	5 00	4 48	4 34
June 3	8 14	7 49	7 30	7 14	7 00	6 49	6 29	6 11	5 54	5 38	5 20	4 59	4 47	4 32
7	8 18	7 52	7 32	7 16	7 03	6 51	6 30	6 12	5 55	5 38	5 20	4 58	4 46	4 31
11	8 22	7 55	7 35	7 18	7 04	6 52	6 31	6 13	5 56	5 39	5 20	4 58	4 45	4 31
15	8 24	7 58	7 37	7 20	7 06	6 54	6 33	6 14	5 57	5 39	5 20	4 58	4 46	4 31
19	8 26	7 59	7 38	7 21	7 07	6 55	6 34	6 15	5 58	5 40	5 21	4 59	4 46	4 31
23	8 27	8 00	7 39	7 22	7 08	6 56	6 35	6 16	5 58	5 41	5 22	5 00	4 47	4 32
27	8 27	8 00	7 39	7 23	7 09	6 56	6 35	6 17	5 59	5 42	5 23	5 01	4 48	4 33
July 1	8 26	7 59	7 39	7 23	7 09	6 56	6 36	6 17	6 00	5 43	5 24	5 02	4 50	4 35
5	8 24	7 58	7 38	7 22	7 08	6 56	6 36	6 18	6 01	5 44	5 25	5 04	4 51	4 37

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Mar. 31	17 45	17 48	17 51	17 54	17 56	17 58	18 01	18 04	18 07	18 11	18 14	18 18	18 20	18 23
Apr. 4	17 35	17 40	17 44	17 47	17 50	17 53	17 58	18 02	18 06	18 10	18 15	18 20	18 24	18 27
8	17 25	17 31	17 37	17 41	17 45	17 48	17 54	18 00	18 05	18 10	18 16	18 23	18 27	18 31
12	17 15	17 23	17 30	17 35	17 40	17 44	17 51	17 58	18 04	18 10	18 17	18 25	18 30	18 35
16	17 06	17 15	17 23	17 29	17 35	17 40	17 48	17 56	18 03	18 11	18 19	18 28	18 33	18 39
20	16 56	17 07	17 16	17 23	17 30	17 35	17 45	17 54	18 02	18 11	18 20	18 30	18 36	18 43
24	16 47	17 00	17 09	17 18	17 25	17 31	17 42	17 52	18 01	18 11	18 21	18 33	18 40	18 48
28	16 38	16 52	17 03	17 13	17 21	17 28	17 40	17 51	18 01	18 11	18 22	18 35	18 43	18 52
May 2	16 30	16 45	16 57	17 08	17 16	17 24	17 37	17 49	18 00	18 12	18 24	18 38	18 46	18 56
6	16 22	16 39	16 52	17 03	17 12	17 21	17 35	17 48	18 00	18 12	18 25	18 41	18 49	19 00
10	16 14	16 33	16 47	16 59	17 09	17 18	17 33	17 47	18 00	18 13	18 27	18 43	18 53	19 04
14	16 07	16 27	16 42	16 55	17 06	17 15	17 32	17 46	18 00	18 14	18 29	18 46	18 56	19 07
18	16 01	16 22	16 38	16 51	17 03	17 13	17 30	17 46	18 00	18 14	18 30	18 48	18 59	19 11
22	15 55	16 17	16 34	16 48	17 00	17 11	17 29	17 45	18 00	18 15	18 32	18 51	19 02	19 15
26	15 50	16 13	16 31	16 46	16 58	17 09	17 28	17 45	18 01	18 16	18 33	18 53	19 05	19 18
30	15 45	16 10	16 29	16 44	16 57	17 08	17 28	17 45	18 01	18 17	18 35	18 55	19 07	19 21
June 3	15 42	16 07	16 26	16 42	16 56	17 07	17 28	17 45	18 02	18 18	18 37	18 57	19 10	19 24
7	15 39	16 05	16 25	16 41	16 55	17 07	17 28	17 46	18 02	18 20	18 38	18 59	19 12	19 27
11	15 37	16 04	16 24	16 41	16 55	17 07	17 28	17 46	18 03	18 21	18 39	19 01	19 14	19 29
15	15 36	16 03	16 24	16 41	16 55	17 07	17 28	17 47	18 04	18 22	18 41	19 03	19 15	19 31
19	15 36	16 04	16 24	16 41	16 55	17 08	17 29	17 48	18 05	18 23	18 42	19 04	19 17	19 32
23	15 37	16 04	16 25	16 42	16 56	17 09	17 30	17 48	18 06	18 23	18 42	19 05	19 18	19 33
27	15 39	16 06	16 27	16 43	16 57	17 10	17 31	17 49	18 07	18 24	18 43	19 05	19 18	19 33
July 1	15 42	16 08	16 29	16 45	16 59	17 11	17 32	17 50	18 07	18 25	18 43	19 05	19 18	19 33
5	15 45	16 11	16 31	16 47	17 01	17 13	17 33	17 51	18 08	18 25	18 44	19 05	19 17	19 32

SUNRISE AND SUNSET, 1997

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UNIVERSAL TIME FOR MERIDIAN OF GREENWICH SUNRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Mar. 31	5 46	5 45	5 43	5 42	5 41	5 39	5 37	5 35	5 33	5 31	5 28	5 25	5 22	5 18
Apr. 4	5 39	5 38	5 36	5 34	5 32	5 30	5 28	5 26	5 23	5 20	5 16	5 12	5 08	5 03
8	5 33	5 31	5 29	5 27	5 24	5 22	5 19	5 16	5 13	5 09	5 04	4 59	4 54	4 47
12	5 27	5 25	5 22	5 19	5 17	5 13	5 10	5 06	5 02	4 58	4 52	4 46	4 40	4 32
16	5 21	5 18	5 15	5 12	5 09	5 05	5 01	4 57	4 52	4 47	4 41	4 34	4 26	4 16
20	5 15	5 12	5 09	5 05	5 01	4 57	4 53	4 48	4 42	4 36	4 29	4 21	4 12	4 01
24	5 09	5 06	5 02	4 58	4 54	4 49	4 44	4 39	4 32	4 25	4 17	4 08	3 58	3 45
28	5 04	5 00	4 56	4 52	4 47	4 42	4 36	4 30	4 23	4 15	4 06	3 56	3 44	3 29
May 2	4 59	4 55	4 50	4 46	4 40	4 35	4 29	4 22	4 14	4 05	3 55	3 44	3 30	3 14
6	4 54	4 50	4 45	4 40	4 34	4 28	4 21	4 14	4 05	3 56	3 45	3 32	3 17	2 58
10	4 50	4 45	4 40	4 34	4 28	4 22	4 14	4 06	3 57	3 47	3 34	3 20	3 03	2 42
14	4 46	4 41	4 35	4 29	4 23	4 16	4 08	3 59	3 49	3 38	3 25	3 09	2 50	2 26
18	4 42	4 37	4 31	4 25	4 18	4 10	4 02	3 52	3 42	3 30	3 16	2 59	2 38	2 10
22	4 39	4 33	4 27	4 21	4 13	4 05	3 56	3 47	3 35	3 22	3 07	2 49	2 25	1 54
26	4 36	4 30	4 24	4 17	4 09	4 01	3 52	3 41	3 29	3 16	2 59	2 39	2 14	1 38
30	4 34	4 28	4 21	4 14	4 06	3 57	3 48	3 37	3 24	3 10	2 52	2 31	2 03	1 21
June 3	4 32	4 26	4 19	4 12	4 04	3 54	3 44	3 33	3 20	3 05	2 46	2 24	1 53	1 03
7	4 31	4 25	4 18	4 10	4 02	3 52	3 42	3 30	3 17	3 01	2 42	2 18	1 45	0 45
11	4 31	4 24	4 17	4 09	4 00	3 51	3 40	3 28	3 14	2 58	2 38	2 13	1 38	0 21
15	4 31	4 24	4 16	4 09	4 00	3 50	3 39	3 27	3 13	2 56	2 36	2 10	1 33	□
19	4 31	4 24	4 17	4 09	4 00	3 50	3 39	3 27	3 13	2 56	2 35	2 09	1 31	□
23	4 32	4 25	4 18	4 10	4 01	3 51	3 40	3 28	3 14	2 57	2 36	2 10	1 32	□
27	4 33	4 26	4 19	4 11	4 02	3 53	3 42	3 30	3 15	2 59	2 38	2 12	1 35	□
July 1	4 35	4 28	4 21	4 13	4 04	3 55	3 44	3 32	3 18	3 02	2 42	2 17	1 41	0 19
5	4 37	4 30	4 23	4 16	4 07	3 58	3 47	3 36	3 22	3 06	2 47	2 23	1 49	0 47

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Mar. 31	18 23	18 24	18 26	18 27	18 29	18 30	18 32	18 34	18 36	18 39	18 41	18 44	18 48	18 52
Apr. 4	18 27	18 29	18 31	18 32	18 34	18 37	18 39	18 41	18 44	18 48	18 51	18 55	19 00	19 05
8	18 31	18 33	18 35	18 38	18 40	18 43	18 46	18 49	18 53	18 56	19 01	19 06	19 12	19 19
12	18 35	18 38	18 40	18 43	18 46	18 49	18 53	18 56	19 01	19 05	19 11	19 17	19 24	19 32
16	18 39	18 42	18 45	18 48	18 52	18 55	18 59	19 04	19 09	19 14	19 21	19 28	19 36	19 46
20	18 43	18 47	18 50	18 54	18 57	19 02	19 06	19 11	19 17	19 23	19 31	19 39	19 48	20 00
24	18 48	18 51	18 55	18 59	19 03	19 08	19 13	19 19	19 25	19 32	19 40	19 50	20 01	20 14
28	18 52	18 55	19 00	19 04	19 09	19 14	19 20	19 26	19 33	19 41	19 50	20 01	20 13	20 28
May 2	18 56	19 00	19 04	19 09	19 14	19 20	19 27	19 34	19 41	19 50	20 00	20 12	20 26	20 43
6	19 00	19 04	19 09	19 14	19 20	19 26	19 33	19 41	19 49	19 59	20 10	20 23	20 39	20 58
10	19 04	19 08	19 14	19 19	19 25	19 32	19 40	19 48	19 57	20 08	20 20	20 34	20 52	21 14
14	19 07	19 13	19 18	19 24	19 31	19 38	19 46	19 55	20 05	20 16	20 30	20 45	21 05	21 30
18	19 11	19 17	19 23	19 29	19 36	19 44	19 52	20 01	20 12	20 24	20 39	20 56	21 18	21 46
22	19 15	19 20	19 27	19 33	19 41	19 49	19 58	20 08	20 19	20 32	20 48	21 07	21 30	22 03
26	19 18	19 24	19 31	19 38	19 45	19 54	20 03	20 14	20 26	20 40	20 56	21 16	21 43	22 20
30	19 21	19 27	19 34	19 41	19 49	19 58	20 08	20 19	20 32	20 46	21 04	21 26	21 54	22 38
June 3	19 24	19 30	19 37	19 45	19 53	20 02	20 12	20 24	20 37	20 52	21 11	21 34	22 05	22 57
7	19 27	19 33	19 40	19 48	19 56	20 06	20 16	20 28	20 42	20 58	21 17	21 41	22 15	23 18
11	19 29	19 35	19 43	19 51	19 59	20 09	20 19	20 31	20 45	21 02	21 22	21 47	22 23	23 47
15	19 31	19 37	19 45	19 53	20 01	20 11	20 22	20 34	20 48	21 05	21 25	21 51	22 29	□
19	19 32	19 39	19 46	19 54	20 03	20 12	20 23	20 36	20 50	21 07	21 27	21 54	22 32	□
23	19 33	19 39	19 47	19 55	20 03	20 13	20 24	20 36	20 51	21 07	21 28	21 54	22 32	□
27	19 33	19 40	19 47	19 55	20 04	20 13	20 24	20 36	20 50	21 07	21 27	21 53	22 30	□
July 1	19 33	19 39	19 47	19 54	20 03	20 12	20 23	20 35	20 49	21 05	21 25	21 50	22 25	23 40
5	19 32	19 38	19 46	19 53	20 02	20 11	20 21	20 33	20 46	21 02	21 21	21 45	22 18	23 17

□ indicates Sun continuously above horizon.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
SUNRISE

Lat.	−55°	−50°	−45°	−40°	−35°	−30°	−20°	−10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July	1	8 26	7 59	7 39	7 23	7 09	6 56	6 36	6 17	6 00	5 43	5 24	5 02	4 50
	5	8 24	7 58	7 38	7 22	7 08	6 56	6 36	6 18	6 01	5 44	5 25	5 04	4 51
	9	8 21	7 56	7 37	7 21	7 07	6 56	6 36	6 18	6 02	5 45	5 27	5 06	4 54
	13	8 18	7 53	7 35	7 19	7 06	6 55	6 35	6 18	6 02	5 46	5 28	5 08	4 56
	17	8 13	7 50	7 32	7 17	7 05	6 54	6 35	6 18	6 03	5 47	5 30	5 10	4 59
	21	8 08	7 46	7 29	7 14	7 02	6 52	6 34	6 18	6 03	5 48	5 31	5 12	5 01
	25	8 02	7 41	7 25	7 11	7 00	6 50	6 33	6 17	6 03	5 48	5 33	5 15	5 04
	29	7 55	7 36	7 20	7 08	6 57	6 47	6 31	6 17	6 03	5 49	5 34	5 17	5 07
	Aug. 2	7 48	7 30	7 16	7 04	6 54	6 45	6 29	6 16	6 03	5 50	5 36	5 20	5 10
		6	7 40	7 24	7 10	6 59	6 50	6 42	6 27	6 14	6 02	5 50	5 37	5 22
	10	7 32	7 17	7 05	6 55	6 46	6 38	6 25	6 13	6 02	5 51	5 38	5 24	5 16
	14	7 24	7 10	6 59	6 50	6 42	6 35	6 22	6 12	6 01	5 51	5 40	5 27	5 19
	18	7 15	7 03	6 53	6 44	6 37	6 31	6 20	6 10	6 00	5 51	5 41	5 29	5 22
	22	7 06	6 55	6 46	6 39	6 32	6 27	6 17	6 08	5 59	5 51	5 42	5 31	5 25
	26	6 56	6 47	6 39	6 33	6 27	6 22	6 14	6 06	5 58	5 51	5 43	5 34	5 28
	30	6 47	6 39	6 32	6 27	6 22	6 18	6 10	6 04	5 57	5 51	5 44	5 36	5 31
	Sept. 3	6 37	6 30	6 25	6 20	6 16	6 13	6 07	6 01	5 56	5 51	5 45	5 38	5 34
		7	6 27	6 22	6 18	6 14	6 11	6 08	6 03	5 59	5 55	5 50	5 46	5 40
	11	6 17	6 13	6 10	6 08	6 05	6 03	6 00	5 56	5 53	5 50	5 46	5 42	5 37
	15	6 07	6 04	6 03	6 01	6 00	5 58	5 56	5 54	5 52	5 50	5 47	5 44	5 41
	19	5 56	5 56	5 55	5 54	5 54	5 53	5 52	5 51	5 50	5 49	5 48	5 47	5 46
	23	5 46	5 47	5 47	5 48	5 48	5 48	5 49	5 49	5 49	5 49	5 49	5 49	5 48
	27	5 36	5 38	5 40	5 41	5 42	5 43	5 45	5 46	5 48	5 49	5 50	5 51	5 52
	Oct. 1	5 26	5 29	5 32	5 35	5 37	5 38	5 41	5 44	5 46	5 49	5 51	5 53	5 55
		5	5 15	5 21	5 25	5 28	5 31	5 34	5 38	5 45	5 48	5 52	5 56	6 00

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July	1	15 42	16 08	16 29	16 45	16 59	17 11	17 32	17 50	18 07	18 25	18 43	19 05	19 18
	5	15 45	16 11	16 31	16 47	17 01	17 13	17 33	17 51	18 08	18 25	18 44	19 05	19 17
	9	15 49	16 15	16 34	16 50	17 03	17 15	17 35	17 52	18 09	18 25	18 43	19 04	19 17
	13	15 54	16 18	16 37	16 52	17 05	17 17	17 36	17 53	18 09	18 26	18 43	19 03	19 15
	17	16 00	16 23	16 41	16 55	17 08	17 19	17 38	17 54	18 10	18 25	18 42	19 02	19 13
	21	16 05	16 27	16 45	16 59	17 11	17 21	17 39	17 55	18 10	18 25	18 41	19 00	19 11
	25	16 12	16 32	16 49	17 02	17 13	17 23	17 41	17 56	18 10	18 24	18 40	18 58	19 08
	29	16 18	16 38	16 53	17 05	17 16	17 26	17 42	17 56	18 10	18 24	18 38	18 55	19 05
	Aug. 2	16 25	16 43	16 57	17 09	17 19	17 28	17 43	17 57	18 10	18 23	18 36	18 53	19 02
		6	16 32	16 49	17 02	17 13	17 22	17 30	17 45	17 57	18 09	18 21	18 34	18 49
	10	16 39	16 54	17 06	17 16	17 25	17 33	17 46	17 58	18 09	18 20	18 32	18 46	18 54
	14	16 46	17 00	17 11	17 20	17 28	17 35	17 47	17 58	18 08	18 18	18 29	18 42	18 50
	18	16 53	17 06	17 16	17 24	17 31	17 37	17 48	17 58	18 07	18 16	18 27	18 38	18 45
	22	17 01	17 12	17 20	17 28	17 34	17 40	17 49	17 58	18 06	18 15	18 24	18 34	18 40
	26	17 08	17 17	17 25	17 31	17 37	17 42	17 50	17 58	18 05	18 12	18 20	18 29	18 35
	30	17 15	17 23	17 30	17 35	17 40	17 44	17 51	17 58	18 04	18 10	18 17	18 25	18 31
	Sept. 3	17 23	17 29	17 34	17 39	17 43	17 46	17 52	17 57	18 03	18 08	18 14	18 20	18 26
		7	17 30	17 35	17 39	17 43	17 46	17 48	17 53	17 57	18 01	18 05	18 10	18 15
	11	17 37	17 41	17 44	17 46	17 48	17 50	17 54	17 57	18 00	18 03	18 06	18 10	18 13
	15	17 45	17 47	17 49	17 50	17 51	17 52	17 55	17 56	17 58	18 00	18 03	18 05	18 07
	19	17 52	17 53	17 53	17 54	17 54	17 55	17 55	17 56	17 57	17 58	17 59	18 00	18 01
	23	18 00	17 59	17 58	17 58	17 57	17 57	17 56	17 56	17 55	17 55	17 55	17 55	17 56
	27	18 07	18 05	18 03	18 01	18 00	17 59	17 57	17 56	17 54	17 53	17 52	17 50	17 49
	Oct. 1	18 15	18 11	18 08	18 05	18 03	18 01	17 58	17 55	17 53	17 51	17 48	17 46	17 44
		5	18 23	18 17	18 13	18 09	18 06	18 04	17 59	17 55	17 52	17 48	17 45	17 39

SUNRISE AND SUNSET, 1997

29

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

SUNRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
July	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
	1 4 35	4 28	4 21	4 13	4 04	3 55	3 44	3 32	3 18	3 02	2 42	2 17	1 41	0 19
	5 4 37	4 30	4 23	4 16	4 07	3 58	3 47	3 36	3 22	3 06	2 47	2 23	1 49	0 47
	9 4 39	4 33	4 26	4 19	4 10	4 01	3 51	3 40	3 27	3 11	2 53	2 30	1 59	1 08
	13 4 42	4 36	4 29	4 22	4 14	4 05	3 55	3 44	3 32	3 17	3 00	2 38	2 10	1 26
	17 4 45	4 39	4 33	4 26	4 18	4 10	4 00	3 50	3 38	3 24	3 07	2 47	2 21	1 44
	21 4 48	4 43	4 37	4 30	4 23	4 14	4 06	3 56	3 44	3 31	3 16	2 57	2 33	2 01
	25 4 52	4 46	4 41	4 34	4 27	4 20	4 11	4 02	3 51	3 39	3 24	3 07	2 46	2 18
	29 4 55	4 50	4 45	4 39	4 32	4 25	4 17	4 08	3 58	3 47	3 34	3 18	2 58	2 34
	Aug. 2 4 59	4 54	4 49	4 43	4 37	4 31	4 23	4 15	4 06	3 55	3 43	3 28	3 11	2 49
	6 5 03	4 58	4 53	4 48	4 43	4 36	4 29	4 22	4 13	4 04	3 52	3 39	3 24	3 04
	10 5 07	5 02	4 58	4 53	4 48	4 42	4 36	4 29	4 21	4 12	4 02	3 50	3 36	3 19
	14 5 10	5 07	5 03	4 58	4 53	4 48	4 42	4 36	4 29	4 21	4 12	4 01	3 49	3 34
	18 5 14	5 11	5 07	5 03	4 59	4 54	4 49	4 43	4 37	4 29	4 21	4 12	4 01	3 48
	22 5 18	5 15	5 12	5 08	5 04	5 00	4 55	4 50	4 44	4 38	4 31	4 23	4 13	4 02
	26 5 22	5 19	5 16	5 13	5 10	5 06	5 02	4 57	4 52	4 47	4 40	4 33	4 25	4 15
	30 5 26	5 23	5 21	5 18	5 15	5 12	5 08	5 04	5 00	4 55	4 50	4 44	4 37	4 28
	Sept. 3 5 29	5 27	5 25	5 23	5 21	5 18	5 15	5 12	5 08	5 04	4 59	4 54	4 48	4 41
	7 5 33	5 32	5 30	5 28	5 26	5 24	5 21	5 19	5 16	5 13	5 09	5 05	5 00	4 54
	11 5 37	5 36	5 34	5 33	5 31	5 30	5 28	5 26	5 24	5 21	5 18	5 15	5 11	5 07
	15 5 41	5 40	5 39	5 38	5 37	5 36	5 34	5 33	5 31	5 30	5 28	5 25	5 23	5 20
	19 5 45	5 44	5 44	5 43	5 42	5 42	5 41	5 40	5 39	5 38	5 37	5 36	5 34	5 32
	23 5 48	5 48	5 48	5 48	5 48	5 48	5 47	5 47	5 47	5 47	5 46	5 46	5 46	5 45
	27 5 52	5 53	5 53	5 53	5 53	5 54	5 54	5 54	5 55	5 55	5 56	5 56	5 57	5 58
	Oct. 1 5 56	5 57	5 57	5 58	5 59	6 00	6 01	6 02	6 03	6 04	6 05	6 07	6 08	6 10
	5 6 00	6 01	6 02	6 03	6 05	6 06	6 07	6 09	6 11	6 13	6 15	6 17	6 20	6 23

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July	1 19 33	19 39	19 47	19 54	20 03	20 12	20 23	20 35	20 49	21 05	21 25	21 50	22 25	23 40	
	5 19 32	19 38	19 46	19 53	20 02	20 11	20 21	20 33	20 46	21 02	21 21	21 45	22 18	23 17	
	9 19 31	19 37	19 44	19 51	20 00	20 09	20 19	20 30	20 43	20 58	21 16	21 39	22 10	22 59	
	13 19 29	19 35	19 42	19 49	19 57	20 06	20 15	20 26	20 39	20 53	21 10	21 32	22 00	22 41	
	17 19 27	19 33	19 39	19 46	19 54	20 02	20 11	20 22	20 33	20 47	21 03	21 23	21 49	22 25	
	21 19 24	19 30	19 36	19 42	19 50	19 57	20 06	20 16	20 27	20 40	20 56	21 14	21 37	22 08	
	25 19 21	19 26	19 32	19 38	19 45	19 52	20 01	20 10	20 21	20 33	20 47	21 04	21 25	21 52	
	29 19 17	19 22	19 27	19 33	19 40	19 47	19 55	20 04	20 13	20 25	20 38	20 53	21 12	21 36	
	Aug. 2 19 13	19 18	19 23	19 28	19 34	19 41	19 48	19 56	20 05	20 16	20 28	20 42	20 59	21 20	
	6 19 08	19 13	19 17	19 23	19 28	19 34	19 41	19 49	19 57	20 07	20 18	20 30	20 46	21 04	
	10 19 03	19 07	19 12	19 17	19 22	19 28	19 34	19 41	19 48	19 57	20 07	20 18	20 32	20 49	
	14 18 58	19 02	19 06	19 10	19 15	19 20	19 26	19 32	19 39	19 47	19 56	20 06	20 18	20 33	
	18 18 53	18 56	19 00	19 04	19 08	19 13	19 18	19 23	19 30	19 37	19 45	19 54	20 05	20 17	
	22 18 47	18 50	18 53	18 57	19 01	19 05	19 09	19 14	19 20	19 26	19 33	19 41	19 51	20 02	
	26 18 41	18 44	18 46	18 50	18 53	18 57	19 01	19 05	19 10	19 15	19 21	19 28	19 37	19 46	
	30 18 35	18 37	18 40	18 42	18 45	18 48	18 52	18 55	19 00	19 04	19 10	19 16	19 22	19 31	
	Sept. 3 18 28	18 30	18 32	18 35	18 37	18 40	18 43	18 46	18 49	18 53	18 58	19 03	19 08	19 15	
	7 18 22	18 24	18 25	18 27	18 29	18 31	18 33	18 36	18 39	18 42	18 46	18 50	18 54	18 59	
	11 18 15	18 17	18 18	18 19	18 21	18 22	18 24	18 26	18 28	18 31	18 33	18 36	18 40	18 44	
	15 18 09	18 10	18 11	18 12	18 13	18 14	18 15	18 16	18 18	18 19	18 21	18 23	18 26	18 29	
	19 18 02	18 03	18 03	18 04	18 04	18 05	18 06	18 06	18 07	18 08	18 09	18 10	18 12	18 13	
	23 17 56	17 56	17 56	17 56	17 56	17 56	17 56	17 56	17 56	17 57	17 57	17 57	17 57	17 58	
	27 17 49	17 49	17 48	17 48	17 48	17 47	17 47	17 46	17 46	17 45	17 45	17 44	17 43	17 42	
	Oct. 1 17 42	17 42	17 41	17 40	17 39	17 39	17 38	17 36	17 35	17 34	17 33	17 31	17 29	17 27	
	5 17 36	17 35	17 34	17 33	17 31	17 30	17 28	17 27	17 25	17 23	17 21	17 18	17 15	17 12	

SUNRISE AND SUNSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
SUNRISE

Lat.	−55°	−50°	−45°	−40°	−35°	−30°	−20°	−10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	5 26	5 29	5 32	5 35	5 37	5 38	5 41	5 44	5 46	5 49	5 51	5 53	5 55	5 56
5	5 15	5 21	5 25	5 28	5 31	5 34	5 38	5 42	5 45	5 48	5 52	5 56	5 58	6 00
9	5 05	5 12	5 17	5 22	5 26	5 29	5 35	5 39	5 44	5 48	5 53	5 58	6 01	6 04
13	4 55	5 03	5 10	5 16	5 20	5 24	5 31	5 37	5 43	5 48	5 54	6 01	6 04	6 08
17	4 45	4 55	5 03	5 09	5 15	5 20	5 28	5 35	5 42	5 49	5 55	6 03	6 08	6 12
21	4 36	4 47	4 56	5 04	5 10	5 16	5 25	5 34	5 41	5 49	5 57	6 06	6 11	6 17
25	4 27	4 39	4 50	4 58	5 05	5 12	5 23	5 32	5 41	5 49	5 58	6 09	6 14	6 21
29	4 17	4 32	4 43	4 53	5 01	5 08	5 20	5 31	5 40	5 50	6 00	6 12	6 18	6 26
Nov. 2	4 09	4 25	4 37	4 48	4 57	5 05	5 18	5 29	5 40	5 51	6 02	6 15	6 22	6 30
6	4 00	4 18	4 32	4 43	4 53	5 01	5 16	5 29	5 40	5 52	6 04	6 18	6 26	6 35
10	3 53	4 12	4 27	4 39	4 50	4 59	5 14	5 28	5 40	5 53	6 06	6 21	6 30	6 39
14	3 45	4 06	4 22	4 35	4 47	4 56	5 13	5 28	5 41	5 54	6 08	6 24	6 33	6 44
18	3 39	4 01	4 18	4 32	4 44	4 54	5 12	5 27	5 42	5 56	6 11	6 27	6 37	6 48
22	3 33	3 56	4 15	4 30	4 42	4 53	5 12	5 28	5 43	5 57	6 13	6 31	6 41	6 53
26	3 27	3 52	4 12	4 27	4 41	4 52	5 11	5 28	5 44	5 59	6 15	6 34	6 45	6 57
30	3 23	3 49	4 10	4 26	4 39	4 51	5 12	5 29	5 45	6 01	6 18	6 37	6 49	7 02
Dec. 4	3 19	3 47	4 08	4 25	4 39	4 51	5 12	5 30	5 47	6 03	6 21	6 41	6 52	7 05
8	3 17	3 46	4 07	4 24	4 39	4 52	5 13	5 31	5 48	6 05	6 23	6 44	6 55	7 09
12	3 16	3 45	4 07	4 25	4 40	4 52	5 14	5 33	5 50	6 07	6 25	6 46	6 58	7 12
16	3 15	3 45	4 08	4 26	4 41	4 54	5 16	5 34	5 52	6 09	6 28	6 49	7 01	7 15
20	3 16	3 46	4 09	4 27	4 42	4 55	5 17	5 36	5 54	6 11	6 30	6 51	7 04	7 18
24	3 18	3 48	4 11	4 29	4 44	4 57	5 19	5 38	5 56	6 13	6 32	6 53	7 05	7 20
28	3 22	3 51	4 14	4 32	4 47	5 00	5 22	5 40	5 58	6 15	6 34	6 55	7 07	7 21
32	3 26	3 55	4 17	4 35	4 50	5 02	5 24	5 43	6 00	6 17	6 35	6 56	7 08	7 22
36	3 31	3 59	4 21	4 38	4 53	5 05	5 26	5 45	6 02	6 18	6 36	6 57	7 09	7 22

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	18 15	18 11	18 08	18 05	18 03	18 01	17 58	17 55	17 53	17 51	17 48	17 46	17 44	17 42
5	18 23	18 17	18 13	18 09	18 06	18 04	17 59	17 55	17 52	17 48	17 45	17 41	17 39	17 36
9	18 30	18 24	18 18	18 13	18 10	18 06	18 00	17 55	17 51	17 46	17 41	17 36	17 33	17 30
13	18 38	18 30	18 23	18 18	18 13	18 09	18 01	17 55	17 50	17 44	17 38	17 32	17 28	17 24
17	18 46	18 37	18 29	18 22	18 16	18 11	18 03	17 55	17 49	17 42	17 35	17 27	17 23	17 18
21	18 55	18 43	18 34	18 26	18 20	18 14	18 04	17 56	17 48	17 40	17 32	17 23	17 18	17 12
25	19 03	18 50	18 39	18 31	18 23	18 17	18 06	17 56	17 47	17 39	17 29	17 19	17 13	17 06
29	19 11	18 57	18 45	18 35	18 27	18 20	18 08	17 57	17 47	17 37	17 27	17 16	17 09	17 01
Nov. 2	19 20	19 03	18 51	18 40	18 31	18 23	18 10	17 58	17 47	17 36	17 25	17 12	17 05	16 57
6	19 28	19 10	18 56	18 45	18 35	18 26	18 12	17 59	17 47	17 35	17 23	17 09	17 01	16 52
10	19 37	19 17	19 02	18 49	18 39	18 30	18 14	18 00	17 47	17 35	17 22	17 07	16 58	16 48
14	19 45	19 24	19 07	18 54	18 43	18 33	18 16	18 01	17 48	17 35	17 20	17 04	16 55	16 45
18	19 53	19 30	19 13	18 59	18 47	18 36	18 18	18 03	17 49	17 35	17 20	17 03	16 53	16 42
22	20 01	19 37	19 18	18 03	18 51	18 40	18 21	18 05	17 50	17 35	17 19	17 01	16 51	16 39
26	20 08	19 43	19 23	19 08	18 54	18 43	18 23	18 07	17 51	17 35	17 19	17 00	16 49	16 37
30	20 15	19 49	19 28	19 12	18 58	18 46	18 26	18 09	17 52	17 36	17 19	17 00	16 49	16 36
Dec. 4	20 22	19 54	19 33	19 16	19 02	18 49	18 29	18 11	17 54	17 37	17 20	17 00	16 48	16 35
8	20 27	19 59	19 37	19 20	19 05	18 52	18 31	18 13	17 56	17 39	17 21	17 00	16 48	16 35
12	20 32	20 03	19 41	19 23	19 08	18 55	18 34	18 15	17 57	17 40	17 22	17 01	16 49	16 35
16	20 36	20 06	19 44	19 26	19 11	18 58	18 36	18 17	17 59	17 42	17 24	17 02	16 50	16 36
20	20 39	20 09	19 46	19 28	19 13	19 00	18 38	18 19	18 01	17 44	17 25	17 04	16 52	16 37
24	20 41	20 11	19 48	19 30	19 15	19 02	18 40	18 21	18 03	17 46	17 27	17 06	16 54	16 40
28	20 41	20 12	19 49	19 31	19 16	19 04	18 42	18 23	18 05	17 48	17 30	17 09	16 56	16 42
32	20 41	20 12	19 50	19 32	19 17	19 05	18 43	18 24	18 07	17 50	17 32	17 11	16 59	16 45
36	20 39	20 11	19 49	19 32	19 18	19 05	18 44	18 26	18 09	17 52	17 35	17 14	17 02	16 49

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
SUNRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	5 56	5 57	5 57	5 58	5 59	6 00	6 01	6 02	6 03	6 04	6 05	6 07	6 08	6 10
5	6 00	6 01	6 02	6 03	6 05	6 06	6 07	6 09	6 11	6 13	6 15	6 17	6 20	6 23
9	6 04	6 06	6 07	6 09	6 10	6 12	6 14	6 16	6 19	6 22	6 25	6 28	6 32	6 36
13	6 08	6 10	6 12	6 14	6 16	6 19	6 21	6 24	6 27	6 30	6 34	6 39	6 44	6 49
17	6 12	6 15	6 17	6 19	6 22	6 25	6 28	6 32	6 35	6 39	6 44	6 50	6 56	7 03
21	6 17	6 19	6 22	6 25	6 28	6 31	6 35	6 39	6 44	6 49	6 54	7 00	7 08	7 16
25	6 21	6 24	6 27	6 30	6 34	6 38	6 42	6 47	6 52	6 58	7 04	7 12	7 20	7 30
29	6 26	6 29	6 32	6 36	6 40	6 45	6 49	6 55	7 01	7 07	7 14	7 23	7 33	7 44
Nov. 2	6 30	6 34	6 38	6 42	6 46	6 51	6 57	7 02	7 09	7 16	7 25	7 34	7 45	7 59
6	6 35	6 39	6 43	6 48	6 53	6 58	7 04	7 10	7 18	7 26	7 35	7 46	7 58	8 13
10	6 39	6 44	6 48	6 53	6 59	7 05	7 11	7 18	7 26	7 35	7 45	7 57	8 11	8 28
14	6 44	6 49	6 54	6 59	7 05	7 11	7 18	7 26	7 34	7 44	7 55	8 08	8 24	8 43
18	6 48	6 53	6 59	7 05	7 11	7 18	7 25	7 33	7 43	7 53	8 05	8 20	8 37	8 59
22	6 53	6 58	7 04	7 10	7 17	7 24	7 32	7 41	7 51	8 02	8 15	8 31	8 50	9 14
26	6 57	7 03	7 09	7 15	7 22	7 30	7 38	7 47	7 58	8 10	8 24	8 41	9 02	9 29
30	7 02	7 07	7 13	7 20	7 27	7 35	7 44	7 54	8 05	8 18	8 33	8 51	9 13	9 43
Dec. 4	7 05	7 11	7 18	7 25	7 32	7 41	7 50	8 00	8 12	8 25	8 41	9 00	9 24	9 57
8	7 09	7 15	7 22	7 29	7 37	7 45	7 55	8 05	8 17	8 31	8 48	9 08	9 34	10 10
12	7 12	7 19	7 25	7 33	7 41	7 49	7 59	8 10	8 22	8 37	8 54	9 14	9 41	10 21
16	7 15	7 22	7 28	7 36	7 44	7 53	8 03	8 14	8 26	8 41	8 58	9 20	9 48	10 29
20	7 18	7 24	7 31	7 38	7 46	7 55	8 05	8 16	8 29	8 44	9 01	9 23	9 51	10 34
24	7 20	7 26	7 33	7 40	7 48	7 57	8 07	8 18	8 31	8 46	9 03	9 25	9 53	10 36
28	7 21	7 27	7 34	7 41	7 50	7 58	8 08	8 19	8 32	8 46	9 04	9 25	9 52	10 33
32	7 22	7 28	7 35	7 42	7 50	7 59	8 08	8 19	8 31	8 46	9 02	9 23	9 50	10 28
36	7 22	7 28	7 35	7 42	7 49	7 58	8 07	8 18	8 30	8 44	9 00	9 20	9 45	10 20

SUNSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	17 42	17 42	17 41	17 40	17 39	17 39	17 38	17 36	17 35	17 34	17 33	17 31	17 29	17 27
5	17 36	17 35	17 34	17 33	17 31	17 30	17 28	17 27	17 25	17 23	17 21	17 18	17 15	17 12
9	17 30	17 28	17 27	17 25	17 23	17 21	17 19	17 17	17 15	17 12	17 09	17 05	17 01	16 57
13	17 24	17 22	17 20	17 18	17 15	17 13	17 10	17 08	17 04	17 01	16 57	16 53	16 47	16 42
17	17 18	17 15	17 13	17 11	17 08	17 05	17 02	16 58	16 54	16 50	16 45	16 40	16 34	16 27
21	17 12	17 09	17 07	17 04	17 00	16 57	16 53	16 49	16 45	16 40	16 34	16 28	16 20	16 12
25	17 06	17 04	17 00	16 57	16 53	16 49	16 45	16 40	16 35	16 29	16 23	16 15	16 07	15 57
29	17 01	16 58	16 54	16 51	16 47	16 42	16 37	16 32	16 26	16 19	16 12	16 03	15 54	15 42
Nov. 2	16 57	16 53	16 49	16 45	16 40	16 35	16 30	16 24	16 17	16 10	16 02	15 52	15 41	15 27
6	16 52	16 48	16 44	16 39	16 34	16 29	16 23	16 16	16 09	16 01	15 51	15 41	15 28	15 13
10	16 48	16 44	16 39	16 34	16 29	16 23	16 16	16 09	16 01	15 52	15 42	15 30	15 16	14 59
14	16 45	16 40	16 35	16 29	16 24	16 17	16 10	16 02	15 54	15 44	15 33	15 20	15 04	14 45
18	16 42	16 37	16 31	16 25	16 19	16 12	16 05	15 57	15 47	15 37	15 24	15 10	14 53	14 31
22	16 39	16 34	16 28	16 22	16 15	16 08	16 00	15 51	15 41	15 30	15 17	15 01	14 42	14 18
26	16 37	16 31	16 26	16 19	16 12	16 05	15 56	15 47	15 36	15 24	15 10	14 53	14 32	14 05
30	16 36	16 30	16 24	16 17	16 10	16 02	15 53	15 43	15 32	15 19	15 04	14 46	14 24	13 53
Dec. 4	16 35	16 29	16 22	16 15	16 08	16 00	15 50	15 40	15 29	15 15	14 59	14 40	14 16	13 43
8	16 35	16 28	16 22	16 15	16 07	15 58	15 49	15 38	15 26	15 12	14 56	14 36	14 10	13 34
12	16 35	16 29	16 22	16 15	16 07	15 58	15 48	15 37	15 25	15 11	14 54	14 33	14 06	13 27
16	16 36	16 30	16 23	16 15	16 07	15 59	15 49	15 38	15 25	15 10	14 53	14 32	14 04	13 22
20	16 37	16 31	16 24	16 17	16 09	16 00	15 50	15 39	15 26	15 11	14 54	14 32	14 04	13 21
24	16 40	16 33	16 26	16 19	16 11	16 02	15 52	15 41	15 28	15 14	14 56	14 34	14 06	13 24
28	16 42	16 36	16 29	16 22	16 14	16 05	15 55	15 44	15 32	15 17	15 00	14 39	14 11	13 30
32	16 45	16 39	16 32	16 25	16 17	16 09	15 59	15 48	15 36	15 22	15 05	14 44	14 18	13 39
36	16 49	16 43	16 36	16 29	16 21	16 13	16 04	15 53	15 41	15 27	15 11	14 51	14 26	13 51

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 0	23 13	23 13	23 13	23 12	23 12	23 12	23 12	23 11	23 11	23 11	23 11	23 10	23 10	23 10
1	23 34	23 37	23 40	23 42	23 44	23 46	23 49	23 52	23 54	23 57	.. ..	.. ..	.. ..	.. ..
2	23 56	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 00	0 03	0 05	0 07
3	.. ..	0 03	0 09	0 14	0 18	0 22	0 28	0 34	0 39	0 45	0 51	0 57	1 01	1 06
4	0 21	0 32	0 41	0 48	0 55	1 00	1 10	1 19	1 27	1 35	1 44	1 54	2 00	2 06
5	0 51	1 05	1 17	1 27	1 35	1 43	1 55	2 07	2 17	2 28	2 39	2 52	3 00	3 08
6	1 28	1 45	1 59	2 11	2 21	2 30	2 45	2 58	3 11	3 24	3 37	3 53	4 02	4 12
7	2 14	2 34	2 49	3 02	3 13	3 23	3 40	3 55	4 08	4 22	4 37	4 54	5 04	5 15
8	3 11	3 32	3 48	4 01	4 12	4 22	4 39	4 54	5 08	5 22	5 37	5 54	6 04	6 16
9	4 19	4 39	4 54	5 06	5 17	5 26	5 42	5 56	6 09	6 22	6 36	6 52	7 01	7 12
10	5 37	5 53	6 06	6 16	6 25	6 33	6 47	6 59	7 10	7 21	7 33	7 46	7 54	8 03
11	6 59	7 11	7 20	7 28	7 35	7 41	7 51	8 00	8 08	8 17	8 26	8 36	8 42	8 48
12	8 22	8 29	8 35	8 40	8 44	8 48	8 54	8 59	9 05	9 10	9 15	9 25	9 29	9 29
13	9 44	9 47	9 49	9 50	9 51	9 53	9 55	9 57	9 58	10 00	10 02	10 04	10 06	10 07
14	11 04	11 02	11 00	10 58	10 57	10 56	10 54	10 52	10 50	10 49	10 47	10 45	10 44	10 43
15	12 21	12 15	12 09	12 04	12 01	11 57	11 51	11 46	11 41	11 36	11 31	11 25	11 22	11 18
16	13 36	13 25	13 16	13 08	13 02	12 57	12 47	12 39	12 31	12 23	12 15	12 06	12 00	11 54
17	14 47	14 32	14 20	14 10	14 02	13 55	13 42	13 31	13 21	13 11	13 00	12 47	12 40	12 32
18	15 53	15 35	15 21	15 09	14 59	14 51	14 36	14 23	14 11	13 59	13 46	13 31	13 22	13 13
19	16 54	16 34	16 18	16 05	15 54	15 45	15 28	15 14	15 01	14 47	14 33	14 17	14 07	13 56
20	17 48	17 27	17 11	16 57	16 46	16 36	16 19	16 04	15 50	15 36	15 22	15 05	14 55	14 43
21	18 34	18 14	17 58	17 45	17 34	17 24	17 07	16 53	16 39	16 26	16 11	15 54	15 45	15 34
22	19 13	18 55	18 40	18 28	18 18	18 09	17 53	17 40	17 27	17 15	17 01	16 45	16 36	16 26
23	19 46	19 30	19 17	19 07	18 58	18 50	18 37	18 25	18 14	18 03	17 51	17 37	17 29	17 20
24	20 13	20 01	19 51	19 42	19 35	19 29	19 18	19 08	18 59	18 50	18 40	18 29	18 23	18 15

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 0	10 35	10 37	10 39	10 41	10 42	10 43	10 45	10 47	10 49	10 51	10 52	10 54	10 55	10 57
1	11 41	11 40	11 38	11 37	11 36	11 36	11 34	11 33	11 32	11 31	11 29	11 28	11 27	11 26
2	12 49	12 43	12 38	12 35	12 32	12 29	12 24	12 20	12 16	12 12	12 08	12 03	12 00	11 57
3	13 58	13 48	13 41	13 34	13 29	13 24	13 16	13 09	13 02	12 55	12 48	12 39	12 35	12 29
4	15 09	14 55	14 45	14 36	14 28	14 21	14 10	14 00	13 50	13 41	13 31	13 20	13 13	13 06
5	16 20	16 03	15 50	15 39	15 29	15 21	15 07	14 54	14 42	14 31	14 18	14 04	13 56	13 47
6	17 30	17 10	16 55	16 42	16 31	16 22	16 05	15 51	15 38	15 25	15 11	14 54	14 45	14 34
7	18 34	18 13	17 57	17 44	17 33	17 23	17 06	16 51	16 37	16 23	16 08	15 50	15 40	15 29
8	19 31	19 11	18 55	18 42	18 32	18 22	18 05	17 51	17 37	17 24	17 09	16 52	16 42	16 31
9	20 18	20 01	19 47	19 36	19 26	19 18	19 03	18 50	18 38	18 26	18 13	17 58	17 49	17 39
10	20 57	20 44	20 33	20 24	20 17	20 10	19 58	19 48	19 38	19 28	19 17	19 05	18 58	18 50
11	21 30	21 21	21 13	21 07	21 02	20 57	20 49	20 42	20 35	20 29	20 21	20 13	20 08	20 02
12	21 58	21 53	21 50	21 47	21 44	21 42	21 38	21 34	21 30	21 27	21 23	21 19	21 16	21 13
13	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23	22 23
14	22 48	22 53	22 56	22 59	23 02	23 04	23 08	23 11	23 15	23 18	23 21	23 25	23 28	23 30
15	23 14	23 22	23 29	23 35	23 40	23 44	23 52	23 59	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
16	23 41	23 53	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 05	0 11	0 18	0 26	0 30	0 35
17	.. ..	.. ..	0 03	0 12	0 19	0 25	0 36	0 46	0 55	1 04	1 14	1 25	1 31	1 38
18	0 12	0 28	0 40	0 51	1 00	1 08	1 21	1 33	1 45	1 56	2 08	2 22	2 30	2 39
19	0 47	1 06	1 21	1 33	1 43	1 52	2 08	2 22	2 35	2 47	3 01	3 17	3 26	3 37
20	1 29	1 49	2 05	2 18	2 30	2 39	2 56	3 11	3 25	3 38	3 53	4 10	4 19	4 31
21	2 17	2 37	2 54	3 07	3 18	3 28	3 45	4 00	4 14	4 28	4 43	4 59	5 09	5 20
22	3 10	3 30	3 46	3 58	4 09	4 19	4 35	4 49	5 03	5 16	5 30	5 46	5 55	6 06
23	4 09	4 27	4 41	4 52	5 02	5 10	5 25	5 38	5 50	6 02	6 15	6 29	6 37	6 47
24	5 11	5 25	5 37	5 47	5 55	6 02	6 15	6 26	6 36	6 46	6 57	7 09	7 16	7 24

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
Jan. 0	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	23 10	23 10	23 10	23 10	23 10	23 10	23 10	23 09	23 09	23 09	23 09	23 09	23 09	23 09
2	0 07	0 08	0 09	0 10	0 11	0 13	0 14	0 15	0 17	0 19	0 21	0 23	0 26	0 29
3	1 06	1 08	1 10	1 12	1 14	1 17	1 20	1 23	1 27	1 30	1 35	1 40	1 46	1 52
4	2 06	2 09	2 12	2 16	2 19	2 23	2 28	2 32	2 38	2 44	2 51	2 58	3 07	3 18
5	3 08	3 12	3 16	3 21	3 26	3 31	3 37	3 43	3 50	3 58	4 07	4 18	4 30	4 45
6	4 12	4 17	4 21	4 27	4 33	4 39	4 46	4 53	5 02	5 12	5 23	5 36	5 52	6 11
7	5 15	5 20	5 25	5 31	5 38	5 45	5 52	6 01	6 10	6 21	6 34	6 48	7 06	7 29
8	6 16	6 21	6 26	6 32	6 39	6 46	6 53	7 02	7 11	7 22	7 35	7 50	8 07	8 30
9	7 12	7 17	7 22	7 27	7 33	7 39	7 46	7 54	8 03	8 13	8 24	8 37	8 53	9 12
10	8 03	8 07	8 11	8 15	8 20	8 26	8 31	8 38	8 45	8 53	9 02	9 12	9 24	9 39
11	8 48	8 51	8 54	8 58	9 01	9 05	9 09	9 14	9 19	9 25	9 31	9 39	9 47	9 57
12	9 29	9 31	9 33	9 35	9 37	9 40	9 42	9 45	9 48	9 51	9 55	10 00	10 05	10 10
13	10 07	10 08	10 08	10 09	10 10	10 11	10 11	10 12	10 14	10 15	10 16	10 18	10 19	10 21
14	10 43	10 42	10 42	10 41	10 41	10 40	10 39	10 38	10 37	10 36	10 35	10 34	10 33	10 31
15	11 18	11 17	11 15	11 13	11 11	11 09	11 07	11 04	11 01	10 58	10 55	10 51	10 46	10 41
16	11 54	11 52	11 49	11 46	11 43	11 39	11 35	11 31	11 27	11 21	11 16	11 09	11 01	10 53
17	12 32	12 29	12 25	12 21	12 17	12 12	12 07	12 01	11 55	11 47	11 39	11 30	11 20	11 07
18	13 13	13 09	13 04	12 59	12 54	12 48	12 42	12 35	12 27	12 18	12 08	11 56	11 43	11 27
19	13 56	13 52	13 47	13 41	13 35	13 29	13 21	13 13	13 05	12 55	12 43	12 30	12 14	11 54
20	14 43	14 38	14 33	14 27	14 21	14 14	14 07	13 58	13 49	13 38	13 26	13 11	12 54	12 32
21	15 34	15 29	15 23	15 18	15 11	15 05	14 57	14 49	14 40	14 29	14 17	14 03	13 46	13 24
22	16 26	16 22	16 17	16 11	16 06	15 59	15 52	15 45	15 36	15 27	15 15	15 02	14 47	14 28
23	17 20	17 16	17 12	17 07	17 02	16 57	16 51	16 44	16 37	16 29	16 19	16 08	15 55	15 40
24	18 15	18 12	18 09	18 05	18 01	17 57	17 52	17 46	17 41	17 34	17 27	17 18	17 08	16 56

MOONSET

Jan. 0	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	10 57	10 57	10 58	10 58	10 59	11 00	11 01	11 01	11 02	11 03	11 04	11 06	11 07	11 09
2	11 26	11 26	11 25	11 25	11 24	11 24	11 23	11 22	11 22	11 21	11 20	11 19	11 18	11 17
3	11 57	11 55	11 54	11 52	11 50	11 49	11 47	11 44	11 42	11 39	11 36	11 33	11 29	11 25
4	12 29	12 27	12 24	12 22	12 19	12 16	12 12	12 09	12 04	12 00	11 55	11 49	11 42	11 34
5	13 06	13 02	12 59	12 55	12 51	12 46	12 42	12 36	12 30	12 24	12 16	12 08	11 58	11 47
6	13 47	13 42	13 38	13 33	13 28	13 23	13 16	13 10	13 02	12 54	12 44	12 33	12 20	12 04
7	14 34	14 29	14 24	14 19	14 13	14 06	13 59	13 51	13 42	13 32	13 21	13 07	12 51	12 31
8	15 29	15 24	15 18	15 12	15 06	14 59	14 51	14 43	14 33	14 22	14 09	13 54	13 37	13 14
9	16 31	16 26	16 21	16 15	16 08	16 02	15 54	15 46	15 36	15 25	15 13	14 58	14 41	14 18
10	17 39	17 34	17 30	17 24	17 19	17 13	17 06	16 58	16 50	16 41	16 30	16 17	16 02	15 43
11	18 50	18 46	18 43	18 39	18 34	18 29	18 24	18 18	18 11	18 04	17 56	17 46	17 35	17 21
12	20 02	20 00	19 57	19 54	19 51	19 48	19 44	19 40	19 36	19 31	19 25	19 19	19 11	19 03
13	21 13	21 12	21 11	21 09	21 08	21 06	21 04	21 02	21 00	20 57	20 55	20 51	20 48	20 43
14	22 23	22 23	22 23	22 23	22 23	22 23	22 22	22 22	22 22	22 22	22 22	22 22	22 22	22 22
15	23 30	23 31	23 32	23 34	23 35	23 37	23 38	23 40	23 42	23 44	23 47	23 50	23 53	23 57
16	0 35	0 37	0 40	0 42	0 45	0 48	0 51	0 55	0 59	1 04	1 09	1 14	1 21	1 29
17	1 38	1 41	1 45	1 49	1 53	1 57	2 02	2 07	2 13	2 19	2 27	2 35	2 45	2 57
18	2 39	2 43	2 47	2 52	2 57	3 02	3 08	3 15	3 23	3 31	3 41	3 52	4 05	4 21
19	3 37	3 41	3 46	3 51	3 57	4 04	4 11	4 18	4 27	4 37	4 48	5 01	5 17	5 37
20	4 31	4 36	4 41	4 47	4 53	5 00	5 07	5 15	5 25	5 35	5 48	6 02	6 19	6 41
21	5 20	5 25	5 31	5 37	5 43	5 50	5 57	6 06	6 15	6 26	6 38	6 52	7 09	7 31
22	6 06	6 11	6 16	6 21	6 27	6 34	6 41	6 48	6 57	7 07	7 18	7 32	7 47	8 07
23	6 47	6 51	6 56	7 01	7 06	7 12	7 18	7 25	7 32	7 41	7 51	8 02	8 16	8 32
24	7 24	7 28	7 31	7 36	7 40	7 45	7 50	7 56	8 02	8 09	8 17	8 26	8 37	8 49

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.		-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	23	19 46	19 30	19 17	19 07	18 58	18 50	18 37	18 25	18 14	18 03	17 51	17 37	17 29	17 20
	24	20 13	20 01	19 51	19 42	19 35	19 29	19 18	19 08	18 59	18 50	18 40	18 29	18 23	18 15
	25	20 38	20 29	20 21	20 15	20 10	20 05	19 57	19 50	19 43	19 36	19 29	19 21	19 16	19 11
	26	20 59	20 54	20 49	20 46	20 42	20 40	20 35	20 30	20 26	20 22	20 18	20 13	20 10	20 06
	27	21 20	21 18	21 17	21 15	21 14	21 13	21 12	21 10	21 09	21 07	21 06	21 04	21 03	21 02
	28	21 40	21 42	21 44	21 45	21 46	21 47	21 48	21 50	21 51	21 53	21 54	21 56	21 57	21 58
	29	22 02	22 07	22 11	22 15	22 18	22 21	22 26	22 31	22 35	22 39	22 44	22 49	22 52	22 55
Feb.	30	22 25	22 34	22 41	22 47	22 53	22 58	23 06	23 13	23 20	23 27	23 34	23 43	23 48	23 53
	31	22 51	23 04	23 14	23 23	23 30	23 37	23 48	23 58	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
	1	23 23	23 40	23 52	.. ..	.. ..	.. ..	.. ..	.. ..	0 07	0 17	0 27	0 39	0 45	0 53
	2	.. ..	.. ..	.. ..	0 03	0 12	0 20	0 34	0 46	0 58	1 09	1 22	1 36	1 44	1 54
	3	0 03	0 22	0 37	0 49	0 59	1 09	1 25	1 39	1 52	2 05	2 19	2 35	2 44	2 55
	4	0 53	1 13	1 29	1 42	1 53	2 03	2 20	2 35	2 49	3 02	3 17	3 34	3 44	3 56
	5	1 53	2 14	2 29	2 42	2 53	3 03	3 20	3 34	3 48	4 01	4 16	4 33	4 42	4 53
	6	3 05	3 23	3 38	3 49	3 59	4 08	4 23	4 36	4 48	5 01	5 14	5 29	5 37	5 47
	7	4 26	4 40	4 51	5 01	5 09	5 16	5 28	5 39	5 49	5 59	6 09	6 21	6 28	6 36
	8	5 50	6 00	6 08	6 14	6 20	6 25	6 33	6 40	6 47	6 54	7 02	7 10	7 15	7 21
	9	7 15	7 20	7 24	7 27	7 30	7 33	7 37	7 41	7 44	7 48	7 52	7 56	7 58	8 01
	10	8 40	8 40	8 39	8 39	8 39	8 39	8 39	8 39	8 39	8 39	8 39	8 40	8 40	8 40
	11	10 01	9 56	9 52	9 49	9 46	9 44	9 40	9 36	9 33	9 29	9 26	9 22	9 19	9 17
	12	11 20	11 10	11 03	10 57	10 51	10 47	10 38	10 31	10 25	10 18	10 11	10 04	9 59	9 54
	13	12 34	12 21	12 10	12 01	11 54	11 47	11 35	11 25	11 16	11 07	10 57	10 46	10 40	10 32
	14	13 44	13 27	13 13	13 02	12 53	12 45	12 31	12 19	12 07	11 56	11 44	11 30	11 22	11 13
	15	14 47	14 28	14 12	14 00	13 49	13 40	13 24	13 10	12 57	12 45	12 31	12 15	12 06	11 56
	16	15 43	15 23	15 07	14 53	14 42	14 32	14 16	14 01	13 47	13 34	13 19	13 02	12 53	12 42

MOONSET

		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	23	4 09	4 27	4 41	4 52	5 02	5 10	5 25	5 38	5 50	6 02	6 15	6 29	6 37	6 47
	24	5 11	5 25	5 37	5 47	5 55	6 02	6 15	6 26	6 36	6 46	6 57	7 09	7 16	7 24
	25	6 14	6 26	6 35	6 42	6 49	6 54	7 04	7 13	7 21	7 28	7 37	7 46	7 52	7 58
	26	7 19	7 26	7 32	7 38	7 42	7 46	7 53	7 58	8 04	8 09	8 15	8 22	8 25	8 30
	27	8 24	8 27	8 31	8 33	8 35	8 37	8 41	8 44	8 47	8 49	8 52	8 56	8 58	9 00
	28	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29
	29	10 35	10 31	10 28	10 26	10 23	10 21	10 18	10 15	10 12	10 09	10 06	10 03	10 01	9 59
Feb.	30	11 42	11 34	11 28	11 23	11 19	11 15	11 08	11 02	10 56	10 51	10 45	10 38	10 34	10 30
	31	12 50	12 39	12 29	12 22	12 15	12 09	11 59	11 51	11 42	11 34	11 26	11 16	11 10	11 03
	1	13 59	13 44	13 32	13 22	13 13	13 06	12 53	12 42	12 31	12 21	12 10	11 57	11 49	11 41
	2	15 07	14 49	14 35	14 23	14 13	14 04	13 49	13 36	13 23	13 11	12 58	12 42	12 34	12 24
	3	16 13	15 53	15 37	15 24	15 13	15 03	14 47	14 32	14 18	14 05	13 50	13 34	13 24	13 13
	4	17 13	16 52	16 36	16 23	16 12	16 02	15 45	15 30	15 17	15 03	14 48	14 31	14 21	14 09
	5	18 05	17 46	17 31	17 19	17 08	16 59	16 43	16 30	16 17	16 03	15 49	15 33	15 24	15 13
	6	18 48	18 33	18 21	18 10	18 01	17 54	17 40	17 28	17 17	17 06	16 54	16 40	16 32	16 22
	7	19 25	19 10	19 05	18 57	18 50	18 44	18 34	18 25	18 17	18 08	17 59	17 48	17 42	17 35
	8	19 56	19 50	19 44	19 39	19 35	19 32	19 25	19 20	19 15	19 09	19 04	18 57	18 53	18 49
	9	20 24	20 22	20 20	20 19	20 18	20 16	20 14	20 12	20 11	20 09	20 07	20 05	20 03	20 02
	10	20 51	20 53	20 55	20 57	20 58	20 59	21 01	21 03	21 05	21 07	21 08	21 10	21 12	21 13
	11	21 17	21 24	21 29	21 34	21 38	21 41	21 47	21 53	21 58	22 03	22 08	22 14	22 18	22 22
	12	21 45	21 55	22 04	22 12	22 18	22 23	22 33	22 41	22 49	22 57	23 06	23 16	23 21	23 28
	13	22 15	22 30	22 41	22 51	22 59	23 06	23 19	23 30	23 41	23 51	.. ..	.. ..	.. ..	.. ..
	14	22 49	23 07	23 21	23 33	23 42	23 51	.. ..	.. ..	.. ..	.. ..	0 02	0 15	0 22	0 31
	15	23 29	23 49	.. ..	.. ..	.. ..	.. ..	0 06	0 19	0 31	0 44	0 57	1 12	1 20	1 30
	16	.. ..	.. ..	0 04	0 17	0 28	0 38	0 54	1 08	1 22	1 35	1 49	2 06	2 15	2 26

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 23	17 20	17 16	17 12	17 07	17 02	16 57	16 51	16 44	16 37	16 29	16 19	16 08	15 55	15 40
24	18 15	18 12	18 09	18 05	18 01	17 57	17 52	17 46	17 41	17 34	17 27	17 18	17 08	16 56
25	19 11	19 08	19 06	19 03	19 00	18 57	18 54	18 50	18 45	18 41	18 35	18 29	18 22	18 14
26	20 06	20 05	20 03	20 02	20 00	19 58	19 56	19 54	19 51	19 48	19 45	19 41	19 37	19 32
27	21 02	21 02	21 01	21 01	21 00	20 59	20 59	20 58	20 57	20 56	20 55	20 54	20 53	20 51
28	21 58	21 59	21 59	22 00	22 01	22 01	22 02	22 03	22 04	22 05	22 06	22 07	22 09	22 10
29	22 55	22 57	22 58	23 00	23 02	23 04	23 06	23 09	23 11	23 14	23 18	23 21	23 26	23 31
30	23 53	23 56	23 59	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
31	.. ..	.. ..	.. ..	0 01	0 04	0 08	0 11	0 15	0 20	0 25	0 31	0 37	0 44	0 53
Feb. 1	0 53	0 56	1 00	1 04	1 08	1 13	1 18	1 23	1 30	1 37	1 45	1 54	2 04	2 17
2	1 54	1 58	2 03	2 07	2 13	2 18	2 25	2 32	2 40	2 48	2 58	3 10	3 24	3 41
3	2 55	3 00	3 05	3 11	3 17	3 23	3 31	3 39	3 48	3 58	4 10	4 24	4 40	5 01
4	3 56	4 01	4 06	4 12	4 18	4 25	4 33	4 42	4 51	5 02	5 15	5 29	5 47	6 10
5	4 53	4 58	5 04	5 09	5 16	5 22	5 30	5 38	5 47	5 58	6 10	6 24	6 41	7 02
6	5 47	5 52	5 56	6 01	6 07	6 13	6 19	6 26	6 34	6 44	6 54	7 06	7 20	7 37
7	6 36	6 40	6 43	6 47	6 52	6 56	7 02	7 07	7 13	7 20	7 28	7 37	7 48	8 00
8	7 21	7 23	7 26	7 28	7 31	7 34	7 38	7 42	7 46	7 51	7 56	8 02	8 09	8 17
9	8 01	8 03	8 04	8 05	8 07	8 08	8 10	8 12	8 14	8 17	8 19	8 22	8 26	8 30
10	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 40	8 41
11	9 17	9 16	9 14	9 13	9 12	9 10	9 09	9 07	9 05	9 03	9 01	8 58	8 55	8 51
12	9 54	9 52	9 49	9 47	9 44	9 41	9 38	9 35	9 31	9 26	9 22	9 16	9 10	9 03
13	10 32	10 29	10 26	10 22	10 18	10 14	10 09	10 04	9 59	9 52	9 45	9 37	9 28	9 17
14	11 13	11 09	11 04	11 00	10 55	10 50	10 44	10 37	10 30	10 22	10 13	10 02	9 50	9 35
15	11 56	11 51	11 46	11 41	11 35	11 29	11 22	11 15	11 06	10 57	10 46	10 33	10 18	9 59
16	12 42	12 37	12 32	12 26	12 20	12 13	12 06	11 57	11 48	11 38	11 26	11 12	10 55	10 34

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan. 23	6 47	6 51	6 56	7 01	7 06	7 12	7 18	7 25	7 32	7 41	7 51	8 02	8 16	8 32
24	7 24	7 28	7 31	7 36	7 40	7 45	7 50	7 56	8 02	8 09	8 17	8 26	8 37	8 49
25	7 58	8 01	8 04	8 07	8 10	8 14	8 18	8 22	8 27	8 32	8 38	8 45	8 53	9 02
26	8 30	8 31	8 33	8 36	8 38	8 40	8 43	8 46	8 49	8 53	8 57	9 01	9 06	9 12
27	9 00	9 01	9 02	9 03	9 04	9 05	9 06	9 08	9 09	9 11	9 13	9 15	9 18	9 21
28	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29	9 29
29	9 59	9 58	9 57	9 56	9 54	9 53	9 52	9 50	9 49	9 47	9 45	9 42	9 40	9 36
30	10 30	10 28	10 26	10 24	10 21	10 19	10 16	10 13	10 10	10 06	10 02	9 57	9 52	9 45
31	11 03	11 01	10 58	10 54	10 51	10 47	10 43	10 38	10 33	10 28	10 21	10 14	10 06	9 56
Feb. 1	11 41	11 37	11 33	11 29	11 24	11 19	11 14	11 08	11 01	10 54	10 45	10 36	10 24	10 11
2	12 24	12 19	12 14	12 09	12 04	11 58	11 51	11 44	11 36	11 26	11 16	11 04	10 49	10 32
3	13 13	13 08	13 03	12 57	12 51	12 44	12 37	12 28	12 19	12 09	11 57	11 43	11 26	11 05
4	14 09	14 04	13 59	13 53	13 47	13 40	13 32	13 23	13 14	13 03	12 50	12 36	12 18	11 55
5	15 13	15 08	15 03	14 58	14 52	14 45	14 38	14 30	14 21	14 10	13 59	13 45	13 28	13 08
6	16 22	16 18	16 14	16 09	16 04	15 58	15 52	15 45	15 38	15 29	15 19	15 08	14 55	14 38
7	17 35	17 32	17 29	17 25	17 21	17 17	17 13	17 07	17 02	16 55	16 48	16 40	16 30	16 19
8	18 49	18 47	18 45	18 43	18 40	18 38	18 35	18 32	18 28	18 25	18 20	18 15	18 10	18 03
9	20 02	20 01	20 00	20 00	19 59	19 58	19 57	19 56	19 55	19 53	19 52	19 50	19 48	19 46
10	21 13	21 13	21 14	21 15	21 15	21 16	21 17	21 18	21 19	21 20	21 21	21 23	21 24	21 26
11	22 22	22 23	22 25	22 27	22 29	22 32	22 34	22 37	22 40	22 44	22 48	22 52	22 57	23 03
12	23 28	23 30	23 33	23 37	23 40	23 44	23 48	23 53	23 58	.. ..	.. ..	.. ..	.. ..	.. ..
13	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 04	0 10	0 17	0 26	0 36
14	0 31	0 34	0 38	0 43	0 47	0 52	0 58	1 04	1 11	1 19	1 27	1 37	1 49	2 03
15	1 30	1 35	1 40	1 45	1 50	1 56	2 03	2 10	2 18	2 28	2 38	2 51	3 05	3 23
16	2 26	2 31	2 36	2 42	2 48	2 54	3 02	3 10	3 19	3 29	3 41	3 55	4 12	4 32

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Feb. 15	14 47	14 28	14 12	14 00	13 49	13 40	13 24	13 10	12 57	12 45	12 31	12 15	12 06	11 56
16	15 43	15 23	15 07	14 53	14 42	14 32	14 16	14 01	13 47	13 34	13 19	13 02	12 53	12 42
17	16 32	16 11	15 55	15 42	15 31	15 21	15 05	14 50	14 36	14 23	14 08	13 51	13 42	13 31
18	17 13	16 54	16 39	16 27	16 16	16 07	15 51	15 37	15 24	15 11	14 58	14 42	14 33	14 22
19	17 48	17 31	17 18	17 07	16 58	16 49	16 35	16 23	16 11	16 00	15 47	15 33	15 25	15 15
20	18 17	18 03	17 53	17 43	17 36	17 29	17 17	17 07	16 57	16 47	16 37	16 25	16 18	16 10
21	18 42	18 32	18 24	18 17	18 11	18 06	17 57	17 49	17 41	17 34	17 26	17 16	17 11	17 05
22	19 05	18 59	18 53	18 48	18 45	18 41	18 35	18 30	18 25	18 19	18 14	18 08	18 04	18 00
23	19 26	19 23	19 21	19 19	19 17	19 15	19 12	19 10	19 07	19 05	19 03	19 00	18 58	18 56
24	19 47	19 47	19 48	19 48	19 49	19 49	19 49	19 50	19 50	19 51	19 51	19 52	19 52	19 52
25	20 08	20 12	20 15	20 18	20 21	20 23	20 27	20 30	20 33	20 37	20 40	20 44	20 46	20 49
26	20 30	20 38	20 44	20 50	20 54	20 58	21 06	21 12	21 18	21 24	21 30	21 37	21 42	21 46
27	20 55	21 07	21 16	21 24	21 30	21 36	21 46	21 55	22 04	22 12	22 21	22 32	22 38	22 45
28	21 25	21 39	21 51	22 01	22 10	22 17	22 30	22 41	22 52	23 03	23 14	23 27	23 35	23 44
Mar. 1	22 00	22 18	22 32	22 43	22 53	23 02	23 17	23 30	23 43	23 55	.. ..	.. ..	.. ..	.. ..
2	22 44	23 03	23 19	23 32	23 42	23 52	.. ..	.. ..	.. ..	.. ..	0 09	0 24	0 33	0 43
3	23 37	23 57	.. ..	.. ..	.. ..	.. ..	0 08	0 23	0 36	0 50	1 04	1 21	1 31	1 42
4	.. ..	.. ..	0 13	0 26	0 38	0 47	1 04	1 19	1 32	1 46	2 01	2 18	2 28	2 39
5	0 41	1 00	1 15	1 28	1 38	1 48	2 03	2 17	2 30	2 43	2 57	3 13	3 22	3 33
6	1 55	2 11	2 24	2 35	2 44	2 52	3 06	3 18	3 29	3 40	3 52	4 06	4 14	4 23
7	3 16	3 28	3 38	3 46	3 53	3 59	4 09	4 19	4 27	4 36	4 45	4 56	5 02	5 08
8	4 40	4 48	4 54	4 59	5 03	5 07	5 14	5 19	5 25	5 30	5 36	5 43	5 47	5 51
9	6 06	6 08	6 10	6 12	6 14	6 15	6 17	6 19	6 21	6 23	6 25	6 28	6 29	6 31
10	7 30	7 28	7 26	7 25	7 23	7 22	7 20	7 18	7 17	7 15	7 14	7 12	7 11	7 09
11	8 53	8 46	8 40	8 35	8 31	8 28	8 22	8 16	8 11	8 06	8 01	7 55	7 52	7 48

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Feb. 15	23 29	23 49	.. ..	.. ..	.. ..	.. ..	0 06	0 19	0 31	0 44	0 57	1 12	1 20	1 30
16	.. ..	.. ..	0 04	0 17	0 28	0 38	0 54	1 08	1 22	1 35	1 49	2 06	2 15	2 26
17	0 15	0 35	0 51	1 05	1 16	1 26	1 43	1 57	2 11	2 25	2 40	2 56	3 06	3 17
18	1 06	1 26	1 42	1 55	2 06	2 15	2 32	2 46	3 00	3 13	3 27	3 44	3 53	4 04
19	2 03	2 21	2 35	2 47	2 57	3 06	3 22	3 35	3 47	4 00	4 13	4 28	4 36	4 46
20	3 03	3 19	3 31	3 41	3 50	3 58	4 11	4 23	4 33	4 44	4 56	5 09	5 16	5 25
21	4 05	4 18	4 28	4 36	4 43	4 50	5 00	5 10	5 18	5 27	5 36	5 47	5 53	6 00
22	5 10	5 18	5 26	5 32	5 37	5 41	5 49	5 56	6 02	6 09	6 15	6 23	6 27	6 32
23	6 14	6 20	6 24	6 27	6 30	6 33	6 38	6 42	6 45	6 49	6 53	6 57	7 00	7 03
24	7 20	7 21	7 22	7 23	7 24	7 25	7 26	7 27	7 28	7 29	7 30	7 31	7 32	7 32
25	8 26	8 23	8 21	8 19	8 18	8 17	8 15	8 13	8 11	8 09	8 07	8 05	8 04	8 02
26	9 32	9 26	9 21	9 16	9 13	9 10	9 04	8 59	8 55	8 50	8 45	8 40	8 36	8 33
27	10 39	10 29	10 21	10 14	10 08	10 03	9 55	9 47	9 40	9 32	9 25	9 16	9 11	9 05
28	11 47	11 33	11 22	11 13	11 05	10 58	10 46	10 36	10 27	10 17	10 07	9 55	9 48	9 41
Mar. 1	12 54	12 37	12 23	12 12	12 03	11 54	11 40	11 28	11 16	11 04	10 52	10 38	10 30	10 20
2	13 58	13 39	13 24	13 11	13 01	12 51	12 35	12 21	12 08	11 55	11 41	11 25	11 16	11 05
3	14 58	14 38	14 22	14 09	13 58	13 48	13 31	13 17	13 03	12 49	12 34	12 18	12 08	11 56
4	15 52	15 32	15 17	15 04	14 54	14 44	14 28	14 13	14 00	13 46	13 32	13 15	13 06	12 55
5	16 38	16 21	16 08	15 56	15 47	15 38	15 23	15 10	14 58	14 46	14 33	14 18	14 09	13 59
6	17 18	17 04	16 53	16 44	16 36	16 29	16 17	16 07	15 57	15 47	15 36	15 23	15 16	15 08
7	17 51	17 42	17 34	17 28	17 23	17 18	17 09	17 02	16 55	16 48	16 40	16 31	16 26	16 20
8	18 21	18 16	18 12	18 09	18 06	18 04	17 59	17 56	17 52	17 48	17 44	17 39	17 37	17 34
9	18 49	18 49	18 48	18 48	18 48	18 48	18 48	18 48	18 48	18 48	18 47	18 47	18 47	18 47
10	19 16	19 20	19 24	19 27	19 29	19 32	19 36	19 39	19 43	19 46	19 49	19 53	19 56	19 58
11	19 44	19 52	20 00	20 06	20 11	20 15	20 23	20 30	20 37	20 43	20 50	20 58	21 03	21 08

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
 MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
Feb. 15	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
16	11 56	11 51	11 46	11 41	11 35	11 29	11 22	11 15	11 06	10 57	10 46	10 33	10 18	9 59
17	12 42	12 37	12 32	12 26	12 20	12 13	12 06	11 57	11 48	11 38	11 26	11 12	10 55	10 34
18	13 31	13 26	13 20	13 15	13 08	13 02	12 54	12 46	12 37	12 26	12 14	12 00	11 43	11 21
19	14 22	14 17	14 12	14 07	14 01	13 55	13 47	13 40	13 31	13 21	13 09	12 56	12 40	12 21
20	15 15	15 11	15 07	15 02	14 56	14 51	14 45	14 38	14 30	14 21	14 11	13 59	13 46	13 29
21	16 10	16 06	16 02	15 58	15 54	15 49	15 44	15 38	15 32	15 25	15 17	15 07	14 56	14 43
22	17 05	17 02	16 59	16 56	16 53	16 49	16 45	16 41	16 36	16 31	16 25	16 18	16 10	16 00
23	18 00	17 59	17 57	17 55	17 52	17 50	17 48	17 45	17 42	17 38	17 34	17 30	17 25	17 19
24	18 56	18 55	18 54	18 54	18 53	18 51	18 50	18 49	18 48	18 46	18 44	18 42	18 40	18 37
25	19 52	19 52	19 53	19 53	19 53	19 53	19 53	19 54	19 54	19 54	19 55	19 55	19 56	19 56
26	20 49	20 50	20 51	20 53	20 54	20 56	20 57	20 59	21 01	21 03	21 06	21 09	21 12	21 16
27	21 46	21 48	21 51	21 53	21 56	21 59	22 02	22 05	22 09	22 13	22 18	22 24	22 30	22 37
28	22 45	22 48	22 51	22 55	22 58	23 02	23 07	23 12	23 18	23 24	23 31	23 39	23 48	23 59
Mar. 1	23 44	23 48	23 52	23 56	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
2	.. ..	.. ..	.. ..	.. ..	0 01	0 06	0 12	0 19	0 26	0 34	0 43	0 54	1 06	1 21
3	0 43	0 48	0 53	0 58	1 04	1 10	1 17	1 24	1 33	1 42	1 53	2 06	2 22	2 41
4	1 42	1 47	1 52	1 58	2 04	2 11	2 18	2 27	2 36	2 47	2 59	3 13	3 31	3 52
5	2 39	2 44	2 49	2 55	3 01	3 08	3 16	3 24	3 33	3 44	3 56	4 11	4 28	4 50
6	3 33	3 37	3 42	3 48	3 54	4 00	4 07	4 15	4 23	4 33	4 44	4 57	5 13	5 32
7	4 23	4 27	4 31	4 35	4 40	4 46	4 52	4 58	5 05	5 13	5 22	5 33	5 45	6 00
8	5 08	5 11	5 15	5 18	5 22	5 26	5 30	5 35	5 40	5 46	5 53	6 01	6 10	6 20
9	5 51	5 53	5 55	5 57	5 59	6 02	6 05	6 08	6 11	6 15	6 19	6 23	6 28	6 35
10	6 31	6 32	6 32	6 33	6 34	6 35	6 36	6 37	6 38	6 40	6 41	6 43	6 45	6 47
11	7 09	7 09	7 08	7 08	7 07	7 07	7 06	7 05	7 04	7 03	7 02	7 01	7 00	6 58
12	7 48	7 46	7 44	7 42	7 40	7 38	7 36	7 33	7 30	7 27	7 24	7 20	7 15	7 10

MOONSET

Feb. 15	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
16	1 30	1 35	1 40	1 45	1 50	1 56	2 03	2 10	2 18	2 28	2 38	2 51	3 05	3 23
17	2 26	2 31	2 36	2 42	2 48	2 54	3 02	3 10	3 19	3 29	3 41	3 55	4 12	4 32
18	3 17	3 22	3 28	3 33	3 40	3 46	3 54	4 02	4 12	4 22	4 34	4 49	5 06	5 27
19	4 04	4 09	4 14	4 20	4 26	4 32	4 39	4 47	4 56	5 06	5 18	5 32	5 48	6 08
20	4 46	4 51	4 55	5 00	5 06	5 12	5 18	5 26	5 34	5 43	5 53	6 05	6 19	6 36
21	5 25	5 28	5 32	5 37	5 41	5 47	5 52	5 58	6 05	6 13	6 21	6 31	6 43	6 56
22	6 00	6 03	6 06	6 09	6 13	6 17	6 21	6 26	6 32	6 37	6 44	6 52	7 01	7 11
23	6 32	6 34	6 36	6 39	6 42	6 44	6 48	6 51	6 55	6 59	7 04	7 09	7 15	7 22
24	7 03	7 04	7 05	7 07	7 08	7 10	7 12	7 14	7 16	7 18	7 21	7 24	7 27	7 31
25	7 32	7 33	7 33	7 33	7 34	7 34	7 35	7 35	7 36	7 36	7 37	7 38	7 39	7 40
26	8 02	8 02	8 01	8 00	7 59	7 58	7 58	7 57	7 55	7 54	7 53	7 51	7 50	7 48
27	8 33	8 31	8 29	8 28	8 26	8 24	8 21	8 19	8 16	8 13	8 10	8 06	8 01	7 56
28	9 05	9 03	9 00	8 57	8 54	8 51	8 47	8 43	8 39	8 34	8 28	8 22	8 15	8 06
Mar. 1	9 41	9 37	9 34	9 30	9 26	9 21	9 16	9 11	9 05	8 58	8 50	8 42	8 31	8 20
2	10 20	10 16	10 12	10 07	10 02	9 56	9 50	9 43	9 36	9 27	9 18	9 06	8 53	8 38
3	11 05	11 00	10 55	10 50	10 44	10 38	10 31	10 23	10 14	10 04	9 53	9 39	9 24	9 04
4	11 56	11 51	11 46	11 40	11 34	11 27	11 20	11 11	11 02	10 51	10 39	10 24	10 07	9 45
5	12 55	12 50	12 44	12 39	12 32	12 26	12 18	12 10	12 00	11 50	11 38	11 23	11 06	10 45
6	13 59	13 54	13 50	13 44	13 39	13 33	13 26	13 18	13 10	13 01	12 50	12 37	12 22	12 04
7	15 08	15 04	15 00	14 56	14 52	14 47	14 41	14 35	14 29	14 21	14 12	14 02	13 51	13 37
8	16 20	16 18	16 15	16 12	16 09	16 05	16 01	15 57	15 53	15 47	15 41	15 35	15 27	15 18
9	17 34	17 32	17 31	17 29	17 27	17 26	17 24	17 21	17 19	17 16	17 13	17 10	17 06	17 01
10	18 47	18 47	18 46	18 46	18 46	18 46	18 46	18 46	18 46	18 45	18 45	18 45	18 45	18 44
11	19 58	20 00	20 01	20 02	20 04	20 05	20 07	20 09	20 11	20 13	20 15	20 18	20 22	20 25
12	21 08	21 10	21 13	21 16	21 18	21 22	21 25	21 29	21 33	21 37	21 43	21 49	21 55	22 03

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Mar. 9	6 06	6 08	6 10	6 12	6 14	6 15	6 17	6 19	6 21	6 23	6 25	6 28	6 29	6 31
10	7 30	7 28	7 26	7 25	7 23	7 22	7 20	7 18	7 17	7 15	7 14	7 12	7 11	7 09
11	8 53	8 46	8 40	8 35	8 31	8 28	8 22	8 16	8 11	8 06	8 01	7 55	7 52	7 48
12	10 12	10 01	9 51	9 44	9 37	9 31	9 21	9 13	9 05	8 57	8 48	8 39	8 33	8 27
13	11 27	11 11	10 59	10 49	10 40	10 33	10 20	10 08	9 58	9 47	9 36	9 24	9 16	9 08
14	12 35	12 16	12 02	11 50	11 40	11 31	11 16	11 03	10 50	10 38	10 25	10 10	10 01	9 51
15	13 35	13 15	12 59	12 47	12 36	12 26	12 09	11 55	11 42	11 28	11 14	10 58	10 48	10 37
16	14 28	14 07	13 51	13 38	13 27	13 17	13 00	12 46	12 32	12 18	12 04	11 47	11 37	11 26
17	15 12	14 52	14 37	14 24	14 14	14 04	13 48	13 34	13 21	13 08	12 53	12 37	12 28	12 17
18	15 49	15 31	15 18	15 06	14 56	14 48	14 33	14 20	14 08	13 56	13 43	13 28	13 20	13 10
19	16 20	16 05	15 54	15 44	15 36	15 28	15 16	15 05	14 54	14 44	14 33	14 20	14 12	14 04
20	16 46	16 35	16 26	16 18	16 12	16 06	15 56	15 47	15 39	15 30	15 22	15 11	15 05	14 59
21	17 10	17 02	16 56	16 50	16 46	16 42	16 35	16 28	16 22	16 16	16 10	16 03	15 59	15 54
22	17 32	17 27	17 24	17 21	17 18	17 16	17 12	17 09	17 05	17 02	16 59	16 55	16 52	16 50
23	17 53	17 52	17 51	17 51	17 50	17 50	17 49	17 49	17 48	17 48	17 47	17 47	17 46	17 46
24	18 14	18 17	18 19	18 21	18 23	18 24	18 27	18 29	18 32	18 34	18 36	18 39	18 41	18 43
25	18 36	18 42	18 48	18 52	18 56	19 00	19 06	19 11	19 16	19 21	19 27	19 33	19 36	19 41
26	19 00	19 10	19 18	19 25	19 31	19 37	19 46	19 54	20 02	20 10	20 18	20 27	20 33	20 39
27	19 28	19 42	19 53	20 02	20 10	20 17	20 29	20 39	20 49	21 00	21 10	21 23	21 30	21 38
28	20 01	20 18	20 31	20 42	20 52	21 00	21 15	21 27	21 39	21 51	22 04	22 19	22 27	22 37
29	20 41	21 00	21 15	21 28	21 39	21 48	22 04	22 18	22 31	22 45	22 59	23 15	23 25	23 36
30	21 30	21 50	22 06	22 19	22 30	22 40	22 57	23 12	23 25	23 39	23 54	.. ..	.. ..	.. ..
31	22 29	22 48	23 04	23 17	23 27	23 37	23 53	.. ..	.. ..	.. ..	.. ..	0 11	0 21	0 32
Apr. 1	23 36	23 54	.. ..	.. ..	.. ..	.. ..	.. ..	0 08	0 21	0 34	0 49	1 05	1 14	1 25
2	.. ..	.. ..	0 08	0 19	0 29	0 38	0 52	1 05	1 17	1 29	1 42	1 57	2 05	2 15

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Mar. 9	18 49	18 49	18 48	18 48	18 48	18 48	18 48	18 48	18 48	18 48	18 47	18 47	18 47	18 47
10	19 16	19 20	19 24	19 27	19 29	19 32	19 36	19 39	19 43	19 46	19 49	19 53	19 56	19 58
11	19 44	19 52	20 00	20 06	20 11	20 15	20 23	20 30	20 37	20 43	20 50	20 58	21 03	21 08
12	20 14	20 27	20 37	20 46	20 53	21 00	21 11	21 21	21 30	21 40	21 50	22 01	22 08	22 15
13	20 48	21 04	21 17	21 28	21 37	21 45	21 59	22 11	22 23	22 35	22 47	23 01	23 09	23 18
14	21 26	21 45	22 00	22 13	22 23	22 32	22 48	23 02	23 15	23 28	23 42	23 58	.. ..	.. ..
15	22 11	22 31	22 47	23 00	23 11	23 21	23 38	23 52	.. ..	.. ..	.. ..	.. ..	0 07	0 17
16	23 01	23 21	23 37	23 50	.. ..	.. ..	.. ..	.. ..	0 06	0 20	0 34	0 51	1 01	1 12
17	23 56	.. ..	.. ..	.. ..	0 01	0 11	0 28	0 42	0 56	1 09	1 24	1 40	1 50	2 01
18	.. ..	0 15	0 30	0 42	0 53	1 02	1 17	1 31	1 44	1 57	2 10	2 26	2 35	2 45
19	0 55	1 12	1 25	1 36	1 45	1 53	2 07	2 19	2 31	2 42	2 54	3 08	3 15	3 24
20	1 57	2 10	2 21	2 30	2 38	2 45	2 56	3 06	3 16	3 25	3 35	3 47	3 53	4 00
21	3 00	3 10	3 19	3 25	3 31	3 36	3 45	3 53	4 00	4 07	4 15	4 23	4 28	4 34
22	4 05	4 11	4 17	4 21	4 25	4 28	4 34	4 39	4 43	4 48	4 53	4 58	5 01	5 05
23	5 10	5 13	5 15	5 17	5 18	5 20	5 22	5 24	5 26	5 28	5 30	5 32	5 34	5 35
24	6 16	6 15	6 14	6 13	6 13	6 12	6 11	6 10	6 09	6 08	6 07	6 06	6 06	6 05
25	7 23	7 18	7 14	7 11	7 08	7 05	7 01	6 57	6 53	6 49	6 45	6 41	6 38	6 35
26	8 31	8 22	8 15	8 09	8 03	7 59	7 51	7 44	7 38	7 31	7 25	7 17	7 12	7 07
27	9 38	9 26	9 16	9 07	9 00	8 54	8 43	8 33	8 24	8 16	8 06	7 55	7 49	7 42
28	10 46	10 30	10 17	10 06	9 57	9 50	9 36	9 24	9 13	9 02	8 50	8 37	8 29	8 20
29	11 51	11 32	11 17	11 05	10 55	10 46	10 30	10 17	10 04	9 51	9 38	9 22	9 13	9 03
30	12 51	12 31	12 15	12 03	11 51	11 42	11 25	11 11	10 57	10 43	10 29	10 12	10 02	9 51
31	13 46	13 26	13 10	12 57	12 46	12 37	12 20	12 05	11 52	11 38	11 23	11 07	10 57	10 46
Apr. 1	14 33	14 15	14 01	13 49	13 39	13 30	13 14	13 00	12 48	12 35	12 21	12 05	11 56	11 46
2	15 14	14 59	14 46	14 36	14 28	14 20	14 07	13 55	13 44	13 33	13 21	13 07	12 59	12 50

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
Mar. 9	h m 6 31	h m 6 32	h m 6 32	h m 6 33	h m 6 34	h m 6 35	h m 6 36	h m 6 37	h m 6 38	h m 6 40	h m 6 41	h m 6 43	h m 6 45	h m 6 47
10	7 09	7 09	7 08	7 08	7 07	7 07	7 06	7 05	7 04	7 03	7 02	7 01	7 00	6 58
11	7 48	7 46	7 44	7 42	7 40	7 38	7 36	7 33	7 30	7 27	7 24	7 20	7 15	7 10
12	8 27	8 24	8 21	8 18	8 15	8 11	8 07	8 03	7 58	7 53	7 47	7 40	7 32	7 23
13	9 08	9 04	9 00	8 56	8 52	8 47	8 41	8 36	8 29	8 22	8 13	8 04	7 53	7 40
14	9 51	9 47	9 42	9 37	9 32	9 26	9 19	9 12	9 04	8 55	8 45	8 33	8 19	8 02
15	10 37	10 33	10 27	10 22	10 16	10 09	10 02	9 54	9 45	9 35	9 23	9 10	8 54	8 34
16	11 26	11 21	11 16	11 10	11 04	10 57	10 50	10 41	10 32	10 22	10 09	9 55	9 38	9 17
17	12 17	12 12	12 07	12 02	11 56	11 49	11 42	11 34	11 25	11 15	11 03	10 49	10 33	10 13
18	13 10	13 06	13 01	12 56	12 50	12 44	12 38	12 31	12 23	12 13	12 03	11 51	11 36	11 19
19	14 04	14 00	13 56	13 52	13 47	13 42	13 37	13 30	13 24	13 16	13 07	12 57	12 45	12 31
20	14 59	14 56	14 53	14 49	14 46	14 42	14 37	14 32	14 27	14 21	14 14	14 07	13 58	13 47
21	15 54	15 52	15 50	15 47	15 45	15 42	15 39	15 36	15 32	15 28	15 23	15 18	15 12	15 05
22	16 50	16 49	16 47	16 46	16 45	16 43	16 42	16 40	16 38	16 35	16 33	16 30	16 27	16 23
23	17 46	17 46	17 46	17 46	17 45	17 45	17 45	17 45	17 44	17 44	17 44	17 43	17 43	17 42
24	18 43	18 44	18 45	18 46	18 47	18 48	18 49	18 50	18 52	18 53	18 55	18 57	19 00	19 02
25	19 41	19 42	19 44	19 46	19 49	19 51	19 54	19 57	20 00	20 04	20 08	20 12	20 18	20 24
26	20 39	20 42	20 45	20 48	20 51	20 55	20 59	21 04	21 09	21 14	21 21	21 28	21 36	21 46
27	21 38	21 42	21 46	21 50	21 54	21 59	22 05	22 11	22 17	22 25	22 33	22 43	22 55	23 09
28	22 37	22 42	22 46	22 51	22 57	23 03	23 09	23 17	23 25	23 34	23 44	23 57	.. ..	.. ..
29	23 36	23 40	23 46	23 51	23 57	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 11	0 29
30	.. ..	.. ..	.. ..	.. ..	.. ..	0 04	0 11	0 19	0 29	0 39	0 51	1 05	1 22	1 42
31	0 32	0 37	0 42	0 48	0 54	1 01	1 09	1 17	1 27	1 38	1 50	2 05	2 22	2 44
Apr. 1	1 25	1 30	1 35	1 41	1 47	1 53	2 01	2 09	2 18	2 28	2 40	2 53	3 10	3 30
2	2 15	2 19	2 24	2 29	2 34	2 40	2 46	2 53	3 01	3 10	3 20	3 32	3 45	4 02

MOONSET

Mar. 9	h m 18 47	h m 18 47	h m 18 46	h m 18 46	h m 18 46	h m 18 46	h m 18 46	h m 18 46	h m 18 46	h m 18 45	h m 18 45	h m 18 45	h m 18 45	h m 18 44
10	19 58	20 00	20 01	20 02	20 04	20 05	20 07	20 09	20 11	20 13	20 15	20 18	20 22	20 25
11	21 08	21 10	21 13	21 16	21 18	21 22	21 25	21 29	21 33	21 37	21 43	21 49	21 55	22 03
12	22 15	22 18	22 22	22 26	22 30	22 34	22 39	22 45	22 51	22 58	23 05	23 14	23 25	23 37
13	23 18	23 23	23 27	23 32	23 37	23 43	23 49	23 56	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
14	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 03	0 12	0 22	0 33	0 47	1 03
15	0 17	0 22	0 27	0 33	0 39	0 45	0 52	1 00	1 09	1 19	1 30	1 43	1 59	2 19
16	1 12	1 17	1 22	1 28	1 34	1 40	1 48	1 56	2 05	2 16	2 28	2 42	2 59	3 20
17	2 01	2 06	2 11	2 16	2 22	2 29	2 36	2 45	2 54	3 04	3 16	3 30	3 46	4 07
18	2 45	2 49	2 54	2 59	3 05	3 11	3 18	3 25	3 34	3 43	3 54	4 06	4 21	4 39
19	3 24	3 28	3 33	3 37	3 42	3 48	3 53	4 00	4 07	4 15	4 24	4 35	4 47	5 02
20	4 00	4 04	4 07	4 11	4 15	4 19	4 24	4 29	4 35	4 42	4 49	4 57	5 07	5 18
21	4 34	4 36	4 39	4 42	4 45	4 48	4 51	4 55	4 59	5 04	5 10	5 16	5 23	5 31
22	5 05	5 06	5 08	5 10	5 12	5 14	5 16	5 19	5 21	5 24	5 28	5 31	5 36	5 41
23	5 35	5 36	5 36	5 37	5 38	5 39	5 39	5 40	5 42	5 43	5 44	5 46	5 47	5 49
24	6 05	6 04	6 04	6 04	6 03	6 03	6 02	6 02	6 01	6 01	6 00	5 59	5 58	5 57
25	6 35	6 34	6 33	6 31	6 30	6 28	6 26	6 24	6 22	6 19	6 17	6 14	6 10	6 06
26	7 07	7 05	7 03	7 00	6 57	6 55	6 51	6 48	6 44	6 40	6 35	6 29	6 23	6 16
27	7 42	7 39	7 35	7 32	7 28	7 24	7 19	7 14	7 09	7 03	6 56	6 48	6 39	6 28
28	8 20	8 16	8 12	8 08	8 03	7 57	7 52	7 45	7 38	7 30	7 21	7 11	6 59	6 44
29	9 03	8 58	8 54	8 48	8 43	8 36	8 30	8 22	8 14	8 04	7 53	7 41	7 26	7 08
30	9 51	9 46	9 41	9 35	9 29	9 22	9 15	9 07	8 57	8 47	8 35	8 21	8 04	7 43
31	10 46	10 41	10 35	10 29	10 23	10 16	10 09	10 00	9 51	9 40	9 28	9 13	8 56	8 34
Apr. 1	11 46	11 41	11 36	11 30	11 25	11 18	11 11	11 03	10 54	10 44	10 33	10 20	10 04	9 44
2	12 50	12 46	12 42	12 37	12 32	12 27	12 21	12 14	12 07	11 58	11 49	11 38	11 25	11 09

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
Apr. 1	h m 23 36	h m 23 54	h m	h m	h m	h m	h m	h m 0 08	h m 0 21	h m 0 34	h m 0 49	h m 1 05	h m 1 14	h m 1 25
2	.. ..	.. ..	0 08	0 19	0 29	0 38	0 52	1 05	1 17	1 29	1 42	1 57	2 05	2 15
3	0 51	1 06	1 17	1 26	1 34	1 41	1 53	2 04	2 13	2 23	2 34	2 46	2 53	3 01
4	2 11	2 21	2 29	2 36	2 41	2 46	2 55	3 02	3 09	3 16	3 24	3 32	3 37	3 43
5	3 34	3 39	3 43	3 47	3 50	3 52	3 57	4 01	4 05	4 09	4 13	4 17	4 20	4 23
6	4 58	4 58	4 58	4 59	4 59	4 59	4 59	4 59	5 00	5 00	5 00	5 01	5 01	5 01
7	6 21	6 17	6 13	6 10	6 07	6 05	6 01	5 57	5 54	5 51	5 48	5 44	5 42	5 39
8	7 43	7 34	7 26	7 20	7 15	7 10	7 02	6 55	6 49	6 42	6 35	6 28	6 23	6 18
9	9 02	8 48	8 37	8 28	8 21	8 14	8 02	7 52	7 43	7 34	7 24	7 13	7 06	6 59
10	10 15	9 58	9 45	9 33	9 24	9 16	9 01	8 49	8 37	8 26	8 13	7 59	7 51	7 42
11	11 22	11 02	10 47	10 34	10 23	10 14	9 58	9 44	9 31	9 18	9 04	8 48	8 39	8 28
12	12 19	11 59	11 43	11 29	11 18	11 08	10 51	10 37	10 23	10 09	9 55	9 38	9 28	9 17
13	13 08	12 48	12 32	12 19	12 08	11 58	11 42	11 27	11 14	11 00	10 46	10 29	10 19	10 08
14	13 48	13 30	13 15	13 03	12 53	12 44	12 29	12 15	12 03	11 50	11 36	11 21	11 12	11 02
15	14 22	14 06	13 53	13 43	13 34	13 26	13 13	13 01	12 50	12 38	12 27	12 13	12 05	11 56
16	14 50	14 37	14 27	14 19	14 11	14 05	13 54	13 44	13 35	13 26	13 16	13 05	12 58	12 51
17	15 14	15 05	14 58	14 51	14 46	14 41	14 33	14 26	14 19	14 12	14 05	13 56	13 52	13 46
18	15 37	15 31	15 26	15 22	15 19	15 16	15 11	15 06	15 02	14 58	14 53	14 48	14 45	14 42
19	15 58	15 56	15 54	15 52	15 51	15 50	15 48	15 47	15 45	15 43	15 42	15 40	15 39	15 38
20	16 18	16 20	16 21	16 22	16 23	16 24	16 26	16 27	16 28	16 29	16 31	16 32	16 33	16 34
21	16 40	16 45	16 50	16 53	16 56	16 59	17 04	17 08	17 12	17 16	17 21	17 26	17 29	17 32
22	17 03	17 12	17 20	17 26	17 31	17 36	17 44	17 51	17 58	18 05	18 12	18 21	18 26	18 31
23	17 30	17 43	17 53	18 01	18 09	18 15	18 26	18 36	18 46	18 55	19 05	19 17	19 23	19 31
24	18 02	18 18	18 30	18 41	18 50	18 58	19 12	19 24	19 36	19 47	19 59	20 14	20 22	20 31
25	18 40	18 59	19 13	19 25	19 36	19 45	20 01	20 15	20 28	20 41	20 55	21 11	21 20	21 31

MOONSET

Apr. 1	h m 14 33	h m 14 15	h m 14 01	h m 13 49	h m 13 39	h m 13 30	h m 13 14	h m 13 00	h m 12 48	h m 12 35	h m 12 21	h m 12 05	h m 11 56	h m 11 46
2	15 14	14 59	14 46	14 36	14 28	14 20	14 07	13 55	13 44	13 33	13 21	13 07	12 59	12 50
3	15 48	15 37	15 28	15 20	15 14	15 08	14 58	14 49	14 40	14 32	14 22	14 12	14 06	13 59
4	16 19	16 12	16 06	16 01	15 57	15 53	15 47	15 41	15 36	15 30	15 24	15 18	15 14	15 09
5	16 46	16 44	16 42	16 40	16 39	16 37	16 35	16 33	16 31	16 29	16 27	16 24	16 23	16 21
6	17 13	17 15	17 17	17 18	17 20	17 21	17 22	17 24	17 26	17 27	17 29	17 30	17 31	17 33
7	17 40	17 47	17 52	17 57	18 01	18 04	18 10	18 15	18 20	18 25	18 30	18 36	18 40	18 43
8	18 09	18 20	18 29	18 36	18 43	18 48	18 58	19 07	19 15	19 23	19 31	19 41	19 46	19 53
9	18 42	18 57	19 09	19 18	19 27	19 34	19 47	19 58	20 09	20 19	20 31	20 44	20 51	21 00
10	19 19	19 37	19 51	20 03	20 13	20 22	20 37	20 50	21 03	21 15	21 29	21 44	21 53	22 03
11	20 02	20 22	20 38	20 51	21 02	21 11	21 28	21 42	21 56	22 09	22 24	22 40	22 50	23 01
12	20 51	21 12	21 28	21 41	21 52	22 02	22 19	22 34	22 48	23 01	23 16	23 33	23 42	23 54
13	21 46	22 05	22 21	22 34	22 44	22 54	23 10	23 24	23 37	23 51	.. ..	.. ..	.. ..	.. ..
14	22 44	23 02	23 16	23 28	23 37	23 46	.. ..	.. ..	.. ..	.. ..	0 05	0 21	0 30	0 41
15	23 46	.. ..	.. ..	.. ..	.. ..	.. ..	0 01	0 14	0 26	0 37	0 50	1 05	1 13	1 23
16	.. ..	0 01	0 13	0 22	0 31	0 38	0 50	1 01	1 12	1 22	1 33	1 45	1 52	2 00
17	0 49	1 01	1 10	1 17	1 24	1 30	1 40	1 48	1 56	2 04	2 13	2 23	2 28	2 34
18	1 53	2 01	2 08	2 13	2 17	2 21	2 28	2 34	2 40	2 45	2 51	2 58	3 02	3 06
19	2 58	3 02	3 06	3 09	3 11	3 13	3 17	3 20	3 23	3 26	3 29	3 32	3 34	3 36
20	4 04	4 04	4 05	4 05	4 05	4 05	4 05	4 06	4 06	4 06	4 06	4 06	4 06	4 06
21	5 11	5 07	5 05	5 02	5 00	4 58	4 55	4 52	4 49	4 47	4 44	4 40	4 39	4 36
22	6 19	6 12	6 05	6 00	5 56	5 52	5 45	5 40	5 34	5 29	5 23	5 16	5 12	5 08
23	7 28	7 16	7 07	7 00	6 53	6 47	6 37	6 29	6 21	6 13	6 04	5 54	5 48	5 42
24	8 37	8 22	8 10	8 00	7 51	7 44	7 31	7 20	7 09	6 59	6 48	6 35	6 28	6 19
25	9 44	9 26	9 11	9 00	8 50	8 41	8 26	8 13	8 00	7 48	7 35	7 20	7 11	7 01

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

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UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 1	1 25	1 30	1 35	1 41	1 47	1 53	2 01	2 09	2 18	2 28	2 40	2 53	3 10	3 30
2	2 15	2 19	2 24	2 29	2 34	2 40	2 46	2 53	3 01	3 10	3 20	3 32	3 45	4 02
3	3 01	3 04	3 08	3 12	3 16	3 21	3 26	3 31	3 37	3 44	3 52	4 01	4 11	4 24
4	3 43	3 45	3 48	3 51	3 54	3 57	4 01	4 04	4 09	4 13	4 19	4 25	4 32	4 40
5	4 23	4 24	4 25	4 27	4 28	4 30	4 32	4 34	4 36	4 39	4 42	4 45	4 48	4 53
6	5 01	5 01	5 01	5 01	5 02	5 02	5 02	5 02	5 02	5 03	5 03	5 03	5 04	5 04
7	5 39	5 38	5 37	5 36	5 34	5 33	5 32	5 30	5 28	5 26	5 24	5 21	5 18	5 15
8	6 18	6 16	6 14	6 11	6 08	6 05	6 02	5 59	5 55	5 51	5 46	5 41	5 34	5 27
9	6 59	6 56	6 52	6 48	6 44	6 40	6 35	6 30	6 25	6 18	6 11	6 03	5 53	5 42
10	7 42	7 38	7 34	7 29	7 24	7 18	7 12	7 06	6 58	6 50	6 41	6 30	6 17	6 02
11	8 28	8 23	8 18	8 13	8 07	8 01	7 54	7 46	7 38	7 28	7 17	7 04	6 49	6 30
12	9 17	9 12	9 07	9 01	8 55	8 48	8 41	8 32	8 23	8 13	8 01	7 47	7 30	7 09
13	10 08	10 04	9 58	9 53	9 46	9 40	9 32	9 24	9 15	9 05	8 52	8 38	8 21	8 00
14	11 02	10 57	10 52	10 47	10 41	10 35	10 28	10 20	10 12	10 02	9 51	9 38	9 23	9 04
15	11 56	11 52	11 48	11 43	11 38	11 33	11 27	11 20	11 13	11 04	10 55	10 44	10 31	10 15
16	12 51	12 48	12 44	12 40	12 36	12 32	12 27	12 22	12 16	12 09	12 01	11 53	11 43	11 31
17	13 46	13 44	13 41	13 38	13 35	13 32	13 28	13 25	13 20	13 15	13 10	13 04	12 56	12 48
18	14 42	14 40	14 38	14 37	14 35	14 33	14 31	14 28	14 26	14 23	14 19	14 16	14 11	14 06
19	15 38	15 37	15 37	15 36	15 35	15 35	15 34	15 33	15 32	15 31	15 30	15 29	15 27	15 25
20	16 34	16 35	16 35	16 36	16 36	16 37	16 38	16 39	16 39	16 40	16 41	16 42	16 44	16 45
21	17 32	17 34	17 35	17 37	17 39	17 41	17 43	17 45	17 48	17 51	17 54	17 58	18 02	18 07
22	18 31	18 34	18 36	18 39	18 42	18 45	18 49	18 53	18 57	19 02	19 08	19 14	19 22	19 30
23	19 31	19 34	19 38	19 42	19 46	19 51	19 56	20 01	20 07	20 14	20 22	20 31	20 42	20 54
24	20 31	20 35	20 40	20 45	20 50	20 56	21 02	21 09	21 16	21 25	21 35	21 47	22 01	22 17
25	21 31	21 35	21 41	21 46	21 52	21 59	22 06	22 14	22 23	22 33	22 44	22 58	23 15	23 35

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 1	11 46	11 41	11 36	11 30	11 25	11 18	11 11	11 03	10 54	10 44	10 33	10 20	10 04	9 44	
2	12 50	12 46	12 42	12 37	12 32	12 27	12 21	12 14	12 07	11 58	11 49	11 38	11 25	11 09	
3	13 59	13 56	13 52	13 49	13 45	13 41	13 36	13 31	13 26	13 19	13 12	13 04	12 54	12 43	
4	15 09	15 07	15 05	15 03	15 01	14 58	14 55	14 52	14 48	14 44	14 40	14 35	14 29	14 22	
5	16 21	16 20	16 19	16 18	16 18	16 17	16 15	16 14	16 13	16 11	16 10	16 08	16 06	16 03	
6	17 33	17 33	17 34	17 34	17 35	17 35	17 36	17 37	17 38	17 39	17 40	17 41	17 42	17 44	
7	18 43	18 45	18 47	18 49	18 51	18 53	18 56	18 59	19 02	19 05	19 09	19 13	19 18	19 24	
8	19 53	19 56	19 59	20 02	20 06	20 09	20 14	20 18	20 23	20 29	20 35	20 43	20 51	21 02	
9	21 00	21 04	21 08	21 12	21 17	21 22	21 27	21 34	21 41	21 48	21 57	22 08	22 20	22 34	
10	22 03	22 07	22 12	22 17	22 23	22 29	22 36	22 43	22 52	23 01	23 12	23 24	23 39	23 58	
11	23 01	23 06	23 11	23 17	23 23	23 29	23 37	23 45	23 54	.. ..	.. ..	.. ..	.. ..	.. ..
12	23 54	23 59	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 05	0 17	0 31	0 47	1 08	
13	.. ..	.. ..	0 04	0 10	0 16	0 23	0 30	0 38	0 47	0 58	1 10	1 24	1 41	2 02	
14	0 41	0 45	0 50	0 56	1 02	1 08	1 15	1 23	1 32	1 42	1 53	2 06	2 22	2 41	
15	1 23	1 27	1 31	1 36	1 41	1 47	1 53	2 00	2 08	2 17	2 27	2 38	2 51	3 07	
16	2 00	2 04	2 08	2 12	2 16	2 21	2 26	2 32	2 38	2 45	2 53	3 03	3 13	3 26	
17	2 34	2 37	2 40	2 43	2 47	2 50	2 54	2 59	3 04	3 09	3 15	3 22	3 30	3 39	
18	3 06	3 08	3 10	3 12	3 15	3 17	3 20	3 23	3 26	3 30	3 34	3 39	3 44	3 50	
19	3 36	3 37	3 39	3 40	3 41	3 42	3 44	3 45	3 47	3 49	3 51	3 53	3 56	3 59	
20	4 06	4 06	4 06	4 06	4 06	4 06	4 07	4 07	4 07	4 07	4 07	4 07	4 07	4 07	
21	4 36	4 36	4 35	4 34	4 32	4 31	4 30	4 28	4 27	4 25	4 23	4 21	4 18	4 15	
22	5 08	5 06	5 04	5 02	5 00	4 57	4 54	4 51	4 48	4 44	4 40	4 36	4 30	4 24	
23	5 42	5 39	5 36	5 33	5 29	5 26	5 22	5 17	5 12	5 06	5 00	4 53	4 45	4 35	
24	6 19	6 16	6 12	6 08	6 03	5 58	5 53	5 47	5 40	5 33	5 24	5 14	5 03	4 50	
25	7 01	6 57	6 52	6 47	6 41	6 36	6 29	6 22	6 14	6 05	5 54	5 42	5 28	5 11	

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 24	18 02	18 18	18 30	18 41	18 50	18 58	19 12	19 24	19 36	19 47	19 59	20 14	20 22	20 31
25	18 40	18 59	19 13	19 25	19 36	19 45	20 01	20 15	20 28	20 41	20 55	21 11	21 20	21 31
26	19 26	19 46	20 02	20 15	20 27	20 36	20 53	21 08	21 22	21 35	21 50	22 07	22 17	22 28
27	20 22	20 42	20 58	21 11	21 22	21 32	21 48	22 03	22 17	22 30	22 45	23 02	23 12	23 23
28	21 26	21 45	21 59	22 11	22 22	22 31	22 46	23 00	23 12	23 25	23 38	23 54	.. ..	.. ..
29	22 38	22 53	23 06	23 16	23 25	23 32	23 45	23 57	.. ..	.. ..	.. ..	.. ..	0 03	0 13
30	23 54	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 08	0 18	0 30	0 43	0 50	0 59
May 1	.. ..	0 06	0 15	0 23	0 29	0 35	0 45	0 54	1 02	1 10	1 19	1 29	1 35	1 41
2	1 14	1 21	1 26	1 31	1 35	1 39	1 45	1 51	1 56	2 01	2 06	2 13	2 16	2 20
3	2 34	2 37	2 39	2 40	2 42	2 43	2 45	2 47	2 49	2 51	2 53	2 55	2 56	2 58
4	3 56	3 53	3 51	3 50	3 48	3 47	3 45	3 43	3 42	3 40	3 38	3 37	3 35	3 34
5	5 17	5 10	5 04	4 59	4 55	4 51	4 45	4 40	4 35	4 30	4 25	4 19	4 15	4 12
6	6 36	6 25	6 15	6 08	6 01	5 55	5 45	5 37	5 29	5 20	5 12	5 02	4 57	4 51
7	7 52	7 37	7 24	7 14	7 05	6 58	6 45	6 33	6 23	6 12	6 01	5 48	5 41	5 32
8	9 03	8 44	8 30	8 18	8 07	7 58	7 43	7 29	7 17	7 04	6 51	6 36	6 27	6 17
9	10 06	9 46	9 30	9 17	9 05	8 56	8 39	8 24	8 11	7 57	7 42	7 26	7 16	7 05
10	11 00	10 40	10 23	10 10	9 59	9 49	9 32	9 17	9 03	8 49	8 34	8 18	8 08	7 56
11	11 45	11 26	11 10	10 58	10 47	10 38	10 21	10 07	9 54	9 41	9 26	9 10	9 01	8 50
12	12 22	12 05	11 51	11 40	11 30	11 22	11 07	10 55	10 43	10 31	10 18	10 03	9 55	9 45
13	12 53	12 38	12 27	12 18	12 10	12 03	11 50	11 39	11 29	11 19	11 08	10 56	10 49	10 40
14	13 19	13 08	12 59	12 52	12 46	12 40	12 30	12 22	12 14	12 06	11 58	11 48	11 42	11 36
15	13 42	13 34	13 28	13 23	13 19	13 15	13 09	13 03	12 58	12 52	12 46	12 40	12 36	12 32
16	14 03	13 59	13 56	13 53	13 51	13 49	13 46	13 43	13 40	13 38	13 35	13 31	13 29	13 27
17	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 24
18	14 44	14 48	14 51	14 53	14 55	14 57	15 01	15 04	15 07	15 10	15 13	15 16	15 18	15 21

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 24	8 37	8 22	8 10	8 00	7 51	7 44	7 31	7 20	7 09	6 59	6 48	6 35	6 28	6 19
25	9 44	9 26	9 11	9 00	8 50	8 41	8 26	8 13	8 00	7 48	7 35	7 20	7 11	7 01
26	10 47	10 27	10 11	9 58	9 47	9 38	9 21	9 07	8 53	8 40	8 25	8 09	7 59	7 48
27	11 44	11 23	11 07	10 54	10 43	10 33	10 16	10 02	9 48	9 34	9 19	9 02	8 52	8 41
28	12 33	12 14	11 59	11 47	11 36	11 27	11 11	10 56	10 43	10 30	10 16	9 59	9 50	9 39
29	13 15	12 59	12 46	12 35	12 25	12 17	12 03	11 50	11 39	11 27	11 14	11 00	10 51	10 42
30	13 51	13 38	13 27	13 19	13 11	13 05	12 53	12 43	12 34	12 24	12 14	12 02	11 55	11 47
May 1	14 21	14 12	14 05	13 59	13 54	13 49	13 41	13 34	13 28	13 21	13 14	13 05	13 01	12 55
2	14 48	14 44	14 40	14 37	14 35	14 32	14 28	14 25	14 21	14 18	14 14	14 09	14 07	14 04
3	15 14	15 14	15 14	15 14	15 14	15 14	15 14	15 14	15 14	15 14	15 14	15 14	15 13	15 13
4	15 40	15 44	15 48	15 51	15 54	15 56	16 00	16 04	16 07	16 10	16 14	16 18	16 20	16 23
5	16 07	16 16	16 23	16 29	16 34	16 39	16 47	16 54	17 00	17 07	17 14	17 22	17 27	17 32
6	16 37	16 50	17 01	17 09	17 17	17 23	17 35	17 45	17 54	18 04	18 14	18 25	18 32	18 39
7	17 12	17 28	17 42	17 53	18 02	18 10	18 24	18 37	18 49	19 00	19 13	19 27	19 35	19 45
8	17 52	18 11	18 27	18 39	18 50	18 59	19 15	19 29	19 43	19 56	20 10	20 26	20 35	20 46
9	18 39	19 00	19 16	19 29	19 40	19 50	20 07	20 22	20 36	20 50	21 05	21 22	21 31	21 43
10	19 32	19 52	20 09	20 22	20 33	20 43	21 00	21 14	21 28	21 41	21 56	22 13	22 22	22 33
11	20 30	20 49	21 04	21 16	21 27	21 36	21 51	22 05	22 18	22 30	22 44	22 59	23 08	23 18
12	21 32	21 48	22 01	22 12	22 21	22 29	22 42	22 54	23 05	23 16	23 28	23 42	23 49	23 58
13	22 35	22 48	22 58	23 07	23 15	23 21	23 32	23 42	23 51	.. ..	.. ..	.. ..	.. ..	.. ..
14	23 39	23 49	23 56	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 00	0 10	0 21	0 27	0 34
15	.. ..	.. ..	.. ..	0 03	0 08	0 13	0 21	0 28	0 35	0 42	0 49	0 57	1 02	1 07
16	0 44	0 50	0 54	0 58	1 02	1 05	1 10	1 14	1 18	1 22	1 27	1 32	1 34	1 38
17	1 49	1 51	1 53	1 54	1 55	1 56	1 58	2 00	2 01	2 02	2 04	2 05	2 06	2 07
18	2 56	2 54	2 52	2 51	2 50	2 49	2 47	2 45	2 44	2 43	2 41	2 39	2 38	2 37

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 24	20 31	20 35	20 40	20 45	20 50	20 56	21 02	21 09	21 16	21 25	21 35	21 47	22 01	22 17
25	21 31	21 35	21 41	21 46	21 52	21 59	22 06	22 14	22 23	22 33	22 44	22 58	23 15	23 35
26	22 28	22 33	22 39	22 45	22 51	22 58	23 05	23 14	23 23	23 34	23 47	.. ..	.. ..	.. ..
27	23 23	23 28	23 33	23 39	23 45	23 52	23 59	.. ..	.. ..	.. ..	.. ..	0 01	0 19	0 41
28	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 07	0 17	0 27	0 39	0 54	1 11	1 32
29	0 13	0 17	0 22	0 28	0 33	0 39	0 46	0 54	1 02	1 11	1 22	1 35	1 49	2 07
30	0 59	1 03	1 07	1 11	1 16	1 21	1 26	1 33	1 39	1 47	1 56	2 06	2 17	2 31
May 1	1 41	1 44	1 47	1 50	1 54	1 57	2 02	2 06	2 11	2 17	2 23	2 30	2 39	2 48
2	2 20	2 22	2 24	2 26	2 28	2 30	2 33	2 36	2 39	2 42	2 46	2 50	2 55	3 01
3	2 58	2 58	2 59	3 00	3 00	3 01	3 02	3 03	3 04	3 05	3 07	3 08	3 10	3 12
4	3 34	3 34	3 33	3 33	3 32	3 31	3 31	3 30	3 29	3 28	3 27	3 25	3 24	3 22
5	4 12	4 10	4 08	4 06	4 04	4 02	4 00	3 57	3 54	3 51	3 47	3 43	3 39	3 33
6	4 51	4 48	4 45	4 42	4 38	4 35	4 31	4 26	4 22	4 16	4 10	4 03	3 56	3 46
7	5 32	5 28	5 25	5 20	5 16	5 11	5 05	4 59	4 53	4 45	4 37	4 27	4 16	4 03
8	6 17	6 13	6 08	6 03	5 57	5 51	5 45	5 37	5 29	5 20	5 10	4 58	4 43	4 26
9	7 05	7 00	6 55	6 49	6 43	6 37	6 29	6 21	6 12	6 02	5 50	5 36	5 20	4 59
10	7 56	7 51	7 46	7 40	7 34	7 27	7 20	7 11	7 02	6 51	6 39	6 24	6 07	5 45
11	8 50	8 45	8 40	8 35	8 29	8 22	8 15	8 07	7 58	7 47	7 36	7 22	7 05	6 45
12	9 45	9 41	9 36	9 31	9 26	9 20	9 13	9 06	8 58	8 49	8 39	8 27	8 12	7 55
13	10 40	10 37	10 33	10 29	10 24	10 19	10 14	10 08	10 01	9 54	9 45	9 35	9 24	9 10
14	11 36	11 33	11 30	11 27	11 23	11 20	11 15	11 11	11 06	11 00	10 54	10 46	10 38	10 28
15	12 32	12 30	12 28	12 25	12 23	12 20	12 18	12 15	12 11	12 07	12 03	11 58	11 53	11 46
16	13 27	13 26	13 25	13 24	13 23	13 22	13 20	13 19	13 17	13 15	13 13	13 11	13 08	13 05
17	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24
18	15 21	15 22	15 23	15 24	15 25	15 27	15 28	15 30	15 32	15 34	15 36	15 39	15 42	15 45

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 24	6 19	6 16	6 12	6 08	6 03	5 58	5 53	5 47	5 40	5 33	5 24	5 14	5 03	4 50
25	7 01	6 57	6 52	6 47	6 41	6 36	6 29	6 22	6 14	6 05	5 54	5 42	5 28	5 11
26	7 48	7 43	7 38	7 32	7 26	7 20	7 12	7 04	6 55	6 45	6 33	6 19	6 02	5 42
27	8 41	8 36	8 30	8 25	8 18	8 11	8 04	7 55	7 46	7 35	7 22	7 08	6 50	6 28
28	9 39	9 34	9 29	9 23	9 17	9 10	9 03	8 55	8 46	8 35	8 23	8 09	7 53	7 32
29	10 42	10 37	10 33	10 28	10 22	10 16	10 10	10 03	9 55	9 46	9 35	9 23	9 09	8 51
30	11 47	11 44	11 40	11 36	11 32	11 27	11 22	11 16	11 10	11 03	10 55	10 45	10 35	10 22
May 1	12 55	12 53	12 50	12 47	12 44	12 41	12 37	12 33	12 29	12 24	12 19	12 12	12 05	11 57
2	14 04	14 03	14 01	14 00	13 58	13 57	13 55	13 53	13 50	13 48	13 45	13 42	13 38	13 34
3	15 13	15 13	15 13	15 13	15 13	15 13	15 13	15 13	15 13	15 13	15 12	15 12	15 12	15 12
4	16 23	16 24	16 25	16 27	16 28	16 29	16 31	16 33	16 35	16 37	16 40	16 43	16 46	16 50
5	17 32	17 34	17 37	17 39	17 42	17 45	17 49	17 52	17 56	18 01	18 06	18 12	18 19	18 27
6	18 39	18 43	18 46	18 50	18 54	18 59	19 04	19 10	19 16	19 22	19 30	19 39	19 50	20 02
7	19 45	19 49	19 53	19 58	20 04	20 09	20 16	20 23	20 30	20 39	20 49	21 01	21 15	21 31
8	20 46	20 51	20 56	21 02	21 08	21 14	21 21	21 29	21 38	21 48	22 00	22 14	22 30	22 50
9	21 43	21 48	21 53	21 59	22 05	22 12	22 19	22 28	22 37	22 48	23 00	23 15	23 32	23 54
10	22 33	22 38	22 43	22 49	22 55	23 02	23 09	23 17	23 27	23 37	23 49	.. ..	.. ..	.. ..
11	23 18	23 23	23 28	23 33	23 38	23 45	23 51	23 59	.. ..	.. ..	.. ..	0 03	0 20	0 40
12	23 58	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 07	0 16	0 27	0 39	0 54	1 12
13	.. ..	0 02	0 06	0 11	0 16	0 21	0 27	0 33	0 40	0 48	0 57	1 07	1 19	1 34
14	0 34	0 37	0 41	0 44	0 48	0 52	0 57	1 02	1 08	1 14	1 21	1 29	1 38	1 49
15	1 07	1 09	1 12	1 14	1 17	1 20	1 23	1 27	1 31	1 36	1 41	1 46	1 53	2 00
16	1 38	1 39	1 40	1 42	1 44	1 46	1 48	1 50	1 52	1 55	1 58	2 01	2 05	2 09
17	2 07	2 08	2 08	2 09	2 09	2 10	2 10	2 11	2 12	2 13	2 14	2 15	2 16	2 17
18	2 37	2 36	2 36	2 35	2 35	2 34	2 33	2 32	2 32	2 31	2 29	2 28	2 27	2 25

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
May 17	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 23	14 24
18	14 44	14 48	14 51	14 53	14 55	14 57	f5 01	15 04	15 07	15 10	15 13	15 16	15 18	15 21
19	15 06	15 14	15 20	15 25	15 29	15 33	15 40	15 46	15 52	15 57	16 04	16 11	16 15	16 19
20	15 31	15 43	15 52	15 59	16 06	16 12	16 22	16 30	16 39	16 47	16 56	17 06	17 12	17 19
21	16 01	16 16	16 28	16 37	16 46	16 53	17 06	17 18	17 28	17 39	17 51	18 04	18 11	18 20
22	16 37	16 55	17 09	17 20	17 30	17 39	17 55	18 08	18 20	18 33	18 47	19 02	19 11	19 21
23	17 21	17 41	17 56	18 09	18 20	18 30	18 47	19 01	19 15	19 29	19 43	20 00	20 10	20 21
24	18 14	18 34	18 51	19 04	19 15	19 25	19 42	19 57	20 11	20 25	20 40	20 57	21 07	21 18
25	19 17	19 36	19 51	20 04	20 15	20 24	20 40	20 54	21 08	21 21	21 35	21 51	22 00	22 11
26	20 27	20 44	20 57	21 08	21 18	21 26	21 40	21 52	22 04	22 15	22 28	22 42	22 50	22 59
27	21 43	21 56	22 06	22 15	22 22	22 29	22 40	22 50	22 59	23 08	23 18	23 29	23 35	23 42
28	23 01	23 10	23 17	23 23	23 27	23 32	23 39	23 46	23 52	23 59	.. ..	.. ..	.. ..	.. ..
29	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 05	0 13	0 17	0 22
30	0 20	0 24	0 28	0 30	0 33	0 35	0 39	0 42	0 45	0 48	0 51	0 55	0 57	0 59
31	1 40	1 39	1 39	1 38	1 38	1 38	1 37	1 37	1 36	1 36	1 36	1 35	1 35	1 35
June 1	2 59	2 54	2 49	2 46	2 43	2 40	2 36	2 32	2 28	2 24	2 20	2 16	2 14	2 11
2	4 17	4 07	3 59	3 53	3 47	3 42	3 34	3 27	3 20	3 13	3 06	2 58	2 53	2 48
3	5 33	5 19	5 08	4 59	4 51	4 44	4 32	4 22	4 12	4 03	3 53	3 41	3 34	3 27
4	6 46	6 28	6 14	6 03	5 53	5 45	5 30	5 17	5 06	4 54	4 41	4 27	4 19	4 09
5	7 52	7 32	7 16	7 03	6 53	6 43	6 27	6 12	5 59	5 46	5 32	5 15	5 06	4 55
6	8 50	8 29	8 13	8 00	7 48	7 38	7 21	7 06	6 52	6 38	6 23	6 06	5 56	5 45
7	9 40	9 19	9 03	8 50	8 39	8 29	8 12	7 58	7 44	7 30	7 16	6 59	6 49	6 38
8	10 21	10 02	9 48	9 36	9 25	9 16	9 01	8 47	8 34	8 21	8 08	7 52	7 43	7 33
9	10 54	10 39	10 26	10 16	10 07	9 59	9 45	9 33	9 22	9 11	8 59	8 46	8 38	8 29
10	11 22	11 10	11 00	10 51	10 44	10 38	10 27	10 17	10 08	9 59	9 50	9 38	9 32	9 25

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
May 17	1 49	1 51	1 53	1 54	1 55	1 56	1 58	2 00	2 01	2 02	2 04	2 05	2 06	2 07
18	2 56	2 54	2 52	2 51	2 50	2 49	2 47	2 45	2 44	2 43	2 41	2 39	2 38	2 37
19	4 03	3 57	3 53	3 49	3 45	3 42	3 37	3 32	3 28	3 24	3 19	3 14	3 11	3 08
20	5 12	5 02	4 54	4 48	4 42	4 37	4 29	4 21	4 14	4 07	3 59	3 51	3 46	3 40
21	6 22	6 08	5 57	5 48	5 41	5 34	5 22	5 12	5 02	4 53	4 42	4 31	4 24	4 16
22	7 31	7 14	7 01	6 49	6 40	6 32	6 17	6 05	5 53	5 41	5 29	5 14	5 06	4 57
23	8 38	8 18	8 03	7 50	7 39	7 30	7 14	6 59	6 46	6 33	6 19	6 03	5 53	5 43
24	9 39	9 18	9 02	8 49	8 37	8 27	8 10	7 56	7 42	7 28	7 13	6 56	6 46	6 34
25	10 32	10 12	9 57	9 44	9 33	9 23	9 06	8 52	8 38	8 24	8 10	7 53	7 43	7 32
26	11 17	11 00	10 46	10 34	10 24	10 15	10 00	9 47	9 35	9 22	9 09	8 53	8 44	8 34
27	11 55	11 41	11 29	11 20	11 11	11 04	10 52	10 41	10 30	10 20	10 08	9 56	9 48	9 40
28	12 27	12 16	12 08	12 01	11 55	11 50	11 40	11 32	11 24	11 17	11 08	10 59	10 53	10 47
29	12 54	12 48	12 43	12 39	12 36	12 33	12 27	12 22	12 17	12 13	12 08	12 02	11 59	11 55
30	13 20	13 18	13 17	13 16	13 15	13 14	13 12	13 11	13 09	13 08	13 07	13 05	13 04	13 03
31	13 44	13 47	13 49	13 51	13 53	13 54	13 57	13 59	14 01	14 03	14 05	14 07	14 09	14 10
June 1	14 10	14 17	14 23	14 27	14 32	14 35	14 42	14 47	14 53	14 58	15 03	15 10	15 14	15 18
2	14 38	14 49	14 58	15 05	15 12	15 18	15 28	15 36	15 45	15 53	16 02	16 12	16 18	16 24
3	15 09	15 24	15 36	15 46	15 55	16 02	16 15	16 27	16 38	16 48	17 00	17 13	17 21	17 30
4	15 46	16 04	16 18	16 30	16 41	16 50	17 05	17 18	17 31	17 44	17 57	18 13	18 22	18 32
5	16 29	16 49	17 05	17 18	17 30	17 39	17 56	18 11	18 25	18 38	18 53	19 10	19 20	19 31
6	17 19	17 40	17 56	18 10	18 21	18 31	18 48	19 03	19 17	19 31	19 46	20 03	20 13	20 24
7	18 15	18 35	18 51	19 04	19 15	19 24	19 41	19 55	20 08	20 22	20 36	20 52	21 02	21 12
8	19 16	19 34	19 48	19 59	20 09	20 18	20 33	20 46	20 58	21 10	21 22	21 37	21 45	21 55
9	20 19	20 34	20 46	20 56	21 04	21 11	21 24	21 35	21 45	21 55	22 06	22 18	22 25	22 33
10	21 24	21 35	21 44	21 52	21 58	22 04	22 13	22 22	22 30	22 38	22 46	22 56	23 01	23 07

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
May 17	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24	14 24
18	15 21	15 22	15 23	15 24	15 25	15 27	15 28	15 30	15 32	15 34	15 36	15 39	15 42	15 45
19	16 19	16 21	16 24	16 26	16 28	16 31	16 34	16 38	16 41	16 45	16 50	16 55	17 01	17 08
20	17 19	17 22	17 25	17 29	17 33	17 37	17 41	17 46	17 52	17 58	18 05	18 13	18 22	18 33
21	18 20	18 24	18 28	18 33	18 38	18 43	18 49	18 55	19 02	19 11	19 20	19 30	19 43	19 58
22	19 21	19 26	19 31	19 36	19 42	19 48	19 55	20 03	20 12	20 21	20 33	20 46	21 01	21 21
23	20 21	20 26	20 32	20 38	20 44	20 51	20 58	21 07	21 16	21 27	21 40	21 54	22 12	22 34
24	21 18	21 23	21 29	21 35	21 41	21 48	21 56	22 04	22 14	22 25	22 37	22 52	23 10	23 32
25	22 11	22 16	22 21	22 26	22 32	22 39	22 46	22 54	23 03	23 13	23 24	23 38	23 53	.. ..
26	22 59	23 03	23 08	23 12	23 17	23 23	23 29	23 36	23 43	23 52	.. ..	.. ..	.. ..	0 13
27	23 42	23 46	23 49	23 53	23 57	.. ..	.. ..	.. ..	.. ..	.. ..	0 01	0 12	0 25	0 40
28	.. ..	.. ..	.. ..	.. ..	.. ..	0 01	0 06	0 11	0 17	0 23	0 30	0 38	0 48	0 59
29	0 22	0 24	0 27	0 29	0 32	0 35	0 38	0 41	0 45	0 49	0 54	0 59	1 05	1 12
30	0 59	1 00	1 01	1 03	1 04	1 05	1 07	1 08	1 10	1 12	1 15	1 17	1 20	1 23
31	1 35	1 35	1 35	1 35	1 35	1 35	1 34	1 34	1 34	1 34	1 34	1 34	1 33	1 33
June 1	2 11	2 10	2 08	2 07	2 05	2 04	2 02	2 00	1 58	1 56	1 53	1 50	1 47	1 43
2	2 48	2 45	2 43	2 40	2 37	2 34	2 31	2 27	2 23	2 19	2 14	2 08	2 02	1 54
3	3 27	3 24	3 20	3 16	3 12	3 08	3 03	2 58	2 52	2 45	2 38	2 29	2 20	2 08
4	4 09	4 05	4 01	3 56	3 51	3 45	3 39	3 32	3 25	3 16	3 07	2 56	2 43	2 27
5	4 55	4 51	4 46	4 40	4 34	4 28	4 21	4 13	4 04	3 54	3 43	3 29	3 14	2 54
6	5 45	5 40	5 35	5 29	5 23	5 16	5 08	5 00	4 50	4 40	4 27	4 13	3 55	3 34
7	6 38	6 33	6 28	6 22	6 16	6 09	6 01	5 53	5 44	5 33	5 21	5 06	4 49	4 27
8	7 33	7 28	7 23	7 18	7 12	7 06	6 59	6 51	6 43	6 33	6 22	6 08	5 53	5 34
9	8 29	8 25	8 20	8 16	8 11	8 05	7 59	7 53	7 45	7 37	7 27	7 17	7 04	6 48
10	9 25	9 22	9 18	9 14	9 10	9 06	9 01	8 56	8 50	8 43	8 36	8 27	8 18	8 06

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
May 17	2 07	2 08	2 08	2 09	2 09	2 10	2 10	2 11	2 12	2 13	2 14	2 15	2 16	2 17	2 17
18	2 37	2 36	2 36	2 35	2 35	2 34	2 33	2 32	2 32	2 31	2 29	2 28	2 27	2 25	2 25
19	3 08	3 06	3 05	3 03	3 01	2 59	2 57	2 55	2 52	2 49	2 46	2 42	2 38	2 33	2 33
20	3 40	3 38	3 35	3 33	3 30	3 26	3 23	3 19	3 15	3 10	3 04	2 58	2 51	2 43	2 43
21	4 16	4 13	4 09	4 06	4 01	3 57	3 52	3 47	3 41	3 34	3 26	3 18	3 08	2 56	2 56
22	4 57	4 53	4 48	4 43	4 38	4 33	4 26	4 20	4 12	4 03	3 54	3 43	3 29	3 14	3 14
23	5 43	5 38	5 33	5 27	5 21	5 15	5 07	5 00	4 51	4 41	4 29	4 16	4 00	3 40	3 40
24	6 34	6 29	6 24	6 18	6 11	6 04	5 57	5 48	5 39	5 28	5 15	5 00	4 43	4 20	4 20
25	7 32	7 27	7 21	7 15	7 09	7 02	6 55	6 46	6 37	6 26	6 13	5 59	5 41	5 19	5 19
26	8 34	8 29	8 24	8 19	8 13	8 07	8 00	7 53	7 44	7 34	7 23	7 10	6 55	6 36	6 36
27	9 40	9 36	9 32	9 27	9 23	9 17	9 12	9 05	8 58	8 51	8 42	8 31	8 19	8 04	8 04
28	10 47	10 44	10 41	10 38	10 34	10 31	10 26	10 22	10 17	10 11	10 05	9 57	9 49	9 39	9 39
29	11 55	11 53	11 51	11 49	11 47	11 45	11 43	11 40	11 37	11 33	11 30	11 25	11 20	11 15	11 15
30	13 03	13 02	13 02	13 01	13 00	13 00	12 59	12 58	12 57	12 56	12 55	12 54	12 52	12 51	12 51
31	14 10	14 11	14 12	14 13	14 14	14 14	14 15	14 17	14 18	14 19	14 21	14 22	14 24	14 27	14 27
June 1	15 18	15 20	15 22	15 24	15 26	15 29	15 31	15 34	15 37	15 41	15 45	15 50	15 55	16 02	16 02
2	16 24	16 27	16 30	16 34	16 37	16 41	16 46	16 51	16 56	17 02	17 08	17 16	17 25	17 36	17 36
3	17 30	17 33	17 38	17 42	17 47	17 52	17 58	18 04	18 11	18 19	18 28	18 39	18 51	19 06	19 06
4	18 32	18 37	18 42	18 47	18 53	18 59	19 06	19 13	19 22	19 32	19 43	19 56	20 11	20 30	20 30
5	19 31	19 36	19 41	19 47	19 53	20 00	20 07	20 16	20 25	20 36	20 48	21 02	21 20	21 41	21 41
6	20 24	20 29	20 35	20 41	20 47	20 54	21 01	21 10	21 19	21 30	21 42	21 57	22 14	22 36	22 36
7	21 12	21 17	21 22	21 28	21 34	21 40	21 47	21 55	22 04	22 14	22 25	22 39	22 55	23 14	23 14
8	21 55	21 59	22 04	22 09	22 14	22 20	22 26	22 33	22 41	22 49	22 59	23 11	23 24	23 40	23 40
9	22 33	22 36	22 40	22 44	22 49	22 53	22 59	23 04	23 11	23 18	23 26	23 35	23 45	23 58	23 58
10	23 07	23 10	23 13	23 16	23 19	23 23	23 27	23 31	23 36	23 41	23 47	23 54	.. ..	.. ..	.. ..

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.		-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
June	8	10 21	10 02	9 48	9 36	9 25	9 16	9 01	8 47	8 34	8 21	8 08	7 52	7 43	7 33
	9	10 54	10 39	10 26	10 16	10 07	9 59	9 45	9 33	9 22	9 11	8 59	8 46	8 38	8 29
	10	11 22	11 10	11 00	10 51	10 44	10 38	10 27	10 17	10 08	9 59	9 50	9 38	9 32	9 25
	11	11 46	11 38	11 30	11 24	11 19	11 14	11 06	10 59	10 53	10 46	10 39	10 31	10 26	10 21
	12	12 08	12 03	11 58	11 55	11 52	11 49	11 44	11 40	11 36	11 32	11 27	11 22	11 20	11 16
	13	12 29	12 27	12 25	12 24	12 23	12 22	12 21	12 19	12 18	12 17	12 16	12 14	12 13	12 12
	14	12 49	12 51	12 52	12 54	12 55	12 56	12 58	12 59	13 01	13 02	13 04	13 06	13 07	13 08
	15	13 10	13 16	13 20	13 24	13 27	13 30	13 36	13 40	13 45	13 49	13 54	13 59	14 02	14 06
	16	13 33	13 43	13 50	13 57	14 02	14 07	14 16	14 23	14 30	14 37	14 45	14 54	14 59	15 05
	17	14 00	14 13	14 24	14 33	14 40	14 47	14 58	15 09	15 18	15 28	15 38	15 50	15 57	16 05
	18	14 33	14 49	15 02	15 13	15 23	15 31	15 45	15 57	16 09	16 21	16 34	16 48	16 57	17 06
	19	15 13	15 32	15 47	16 00	16 10	16 20	16 36	16 50	17 03	17 17	17 31	17 47	17 57	18 08
	20	16 02	16 23	16 39	16 52	17 04	17 14	17 31	17 46	18 00	18 14	18 29	18 46	18 56	19 07
	21	17 02	17 23	17 38	17 52	18 03	18 12	18 29	18 44	18 58	19 11	19 26	19 43	19 53	20 04
	22	18 12	18 30	18 44	18 56	19 06	19 15	19 30	19 43	19 56	20 08	20 21	20 36	20 45	20 55
	23	19 28	19 42	19 54	20 04	20 12	20 19	20 32	20 43	20 53	21 03	21 14	21 26	21 33	21 42
	24	20 47	20 58	21 06	21 13	21 19	21 24	21 33	21 41	21 48	21 56	22 04	22 13	22 18	22 24
	25	22 08	22 14	22 18	22 22	22 25	22 28	22 33	22 38	22 42	22 46	22 51	22 56	22 59	23 02
	26	23 28	23 29	23 30	23 30	23 31	23 32	23 33	23 33	23 34	23 35	23 36	23 37	23 38	23 38
	27	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
July	28	0 47	0 43	0 40	0 38	0 36	0 34	0 31	0 28	0 25	0 23	0 20	0 17	0 16	0 14
	29	2 04	1 56	1 50	1 44	1 40	1 35	1 28	1 22	1 17	1 11	1 05	0 58	0 54	0 50
	30	3 20	3 08	2 58	2 49	2 42	2 36	2 26	2 16	2 08	1 59	1 50	1 40	1 34	1 27
	1	4 33	4 16	4 04	3 53	3 44	3 36	3 22	3 11	3 00	2 49	2 37	2 24	2 16	2 07
	2	5 40	5 21	5 06	4 54	4 43	4 34	4 18	4 05	3 52	3 39	3 26	3 10	3 01	2 51

MOONSET

		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
June	8	19 16	19 34	19 48	19 59	20 09	20 18	20 33	20 46	20 58	21 10	21 22	21 37	21 45	21 55
	9	20 19	20 34	20 46	20 56	21 04	21 11	21 24	21 35	21 45	21 55	22 06	22 18	22 25	22 33
	10	21 24	21 35	21 44	21 52	21 58	22 04	22 13	22 22	22 30	22 38	22 46	22 56	23 01	23 07
	11	22 29	22 36	22 42	22 48	22 52	22 56	23 02	23 08	23 13	23 19	23 24	23 31	23 35	23 39
	12	23 34	23 38	23 41	23 43	23 45	23 47	23 51	23 53	23 56	23 59	.. ..	.. ..	.. ..	.. ..
	13	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 02	0 05	0 07	0 09
	14	0 39	0 39	0 39	0 39	0 39	0 39	0 39	0 39	0 39	0 39	0 38	0 38	0 38	0 38
	15	1 46	1 42	1 39	1 36	1 34	1 31	1 28	1 25	1 22	1 19	1 16	1 12	1 10	1 08
	16	2 54	2 46	2 39	2 34	2 29	2 25	2 18	2 12	2 06	2 01	1 54	1 47	1 43	1 39
	17	4 03	3 51	3 41	3 33	3 27	3 21	3 10	3 01	2 53	2 45	2 36	2 25	2 20	2 13
	18	5 12	4 57	4 44	4 34	4 25	4 18	4 05	3 53	3 42	3 32	3 20	3 07	2 59	2 51
	19	6 21	6 02	5 48	5 36	5 25	5 16	5 01	4 47	4 35	4 22	4 09	3 53	3 44	3 34
	20	7 26	7 05	6 49	6 36	6 25	6 15	5 58	5 44	5 30	5 16	5 01	4 44	4 35	4 23
	21	8 24	8 04	7 48	7 34	7 23	7 13	6 56	6 41	6 27	6 13	5 58	5 41	5 31	5 19
	22	9 14	8 56	8 41	8 28	8 18	8 08	7 53	7 39	7 25	7 12	6 58	6 42	6 32	6 21
	23	9 56	9 40	9 28	9 17	9 08	9 00	8 47	8 34	8 23	8 12	7 59	7 45	7 37	7 28
	24	10 31	10 19	10 09	10 01	9 54	9 48	9 38	9 28	9 19	9 11	9 01	8 50	8 44	8 36
	25	11 00	10 53	10 47	10 41	10 37	10 33	10 26	10 20	10 14	10 08	10 02	9 55	9 51	9 46
	26	11 27	11 23	11 21	11 19	11 17	11 15	11 12	11 09	11 07	11 04	11 02	10 59	10 57	10 55
	27	11 51	11 53	11 54	11 54	11 55	11 56	11 57	11 58	11 59	12 00	12 00	12 01	12 02	12 03
	28	12 16	12 22	12 26	12 30	12 33	12 36	12 41	12 46	12 50	12 54	12 58	13 03	13 06	13 10
	29	12 42	12 52	13 00	13 07	13 12	13 17	13 26	13 34	13 41	13 48	13 56	14 05	14 10	14 15
	30	13 12	13 25	13 36	13 45	13 53	14 00	14 12	14 23	14 32	14 42	14 53	15 05	15 12	15 20
July	1	13 45	14 02	14 16	14 27	14 37	14 45	15 00	15 13	15 25	15 37	15 49	16 04	16 13	16 22
	2	14 25	14 44	15 00	15 13	15 24	15 33	15 49	16 04	16 17	16 30	16 45	17 01	17 11	17 22

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

47

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
June	8	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
	9	7 33	7 28	7 23	7 18	7 12	7 06	6 59	6 51	6 43	6 33	6 22	6 08	5 53
	10	8 29	8 25	8 20	8 16	8 11	8 05	7 59	7 53	7 45	7 37	7 27	7 17	7 04
	11	9 25	9 22	9 18	9 14	9 10	9 06	9 01	8 56	8 50	8 43	8 36	8 27	8 18
	12	10 21	10 18	10 16	10 13	10 10	10 07	10 04	10 00	9 56	9 51	9 46	9 40	9 33
	13	11 16	11 15	11 13	11 12	11 11	11 08	11 06	11 04	11 01	10 59	10 56	10 52	10 48
	14	12 12	12 12	12 11	12 11	12 10	12 10	12 09	12 08	12 08	12 07	12 06	12 05	12 04
	15	13 08	13 09	13 10	13 10	13 11	13 12	13 13	13 13	13 14	13 16	13 17	13 18	13 20
	16	14 06	14 07	14 09	14 11	14 13	14 15	14 17	14 20	14 23	14 26	14 29	14 33	14 38
	17	15 05	15 07	15 10	15 13	15 16	15 20	15 23	15 27	15 32	15 37	15 43	15 50	15 57
	18	16 05	16 08	16 12	16 16	16 21	16 25	16 31	16 36	16 43	16 50	16 58	17 07	17 18
	19	17 06	17 11	17 15	17 20	17 26	17 32	17 38	17 45	17 53	18 02	18 13	18 25	18 39
	20	18 08	18 13	18 18	18 24	18 30	18 36	18 44	18 52	19 01	19 12	19 24	19 38	19 55
	21	19 07	19 13	19 18	19 24	19 30	19 38	19 45	19 54	20 04	20 15	20 27	20 42	21 01
	22	20 04	20 09	20 14	20 20	20 26	20 33	20 40	20 49	20 58	21 08	21 21	21 35	21 52
	23	20 55	21 00	21 04	21 09	21 15	21 21	21 28	21 35	21 43	21 52	22 03	22 15	22 29
	24	21 42	21 45	21 49	21 53	21 58	22 02	22 08	22 14	22 20	22 27	22 35	22 45	22 55
	25	22 24	22 26	22 29	22 32	22 35	22 38	22 42	22 46	22 51	22 56	23 01	23 08	23 15
	26	23 02	23 03	23 05	23 07	23 08	23 10	23 12	23 15	23 17	23 20	23 23	23 27	23 31
	27	23 38	23 39	23 39	23 39	23 40	23 40	23 41	23 41	23 42	23 42	23 43	23 44	23 45
	28	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
	29	0 14	0 13	0 12	0 11	0 10	0 09	0 08	0 06	0 05	0 04	0 02	0 00	.. ..
	30	0 50	0 48	0 46	0 43	0 41	0 39	0 36	0 33	0 29	0 26	0 22	0 17	0 12
July	1	1 27	1 24	1 21	1 18	1 14	1 10	1 06	1 01	0 56	0 50	0 44	0 36	0 28
	2	2 07	2 04	1 59	1 55	1 50	1 45	1 39	1 33	1 26	1 19	1 10	1 00	0 48
	3	2 51	2 46	2 42	2 36	2 31	2 25	2 18	2 10	2 02	1 53	1 42	1 29	1 15

MOONSET

June	8	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
	9	21 55	21 59	22 04	22 09	22 14	22 20	22 26	22 33	22 41	22 49	22 59	23 11	23 24
	10	22 33	22 36	22 40	22 44	22 49	22 53	22 59	23 04	23 11	23 18	23 26	23 35	23 45
	11	23 07	23 10	23 13	23 16	23 19	23 23	23 27	23 31	23 36	23 41	23 47	23 54	.. ..
	12	23 39	23 41	23 42	23 45	23 47	23 49	23 52	23 55	23 58	.. ..	.. ..	0 02	0 11
	13	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	0 01	0 05	0 10	0 15
	14	0 09	0 09	0 10	0 11	0 13	0 14	0 15	0 16	0 18	0 20	0 21	0 24	0 26
	15	0 38	0 38	0 38	0 38	0 38	0 38	0 37	0 37	0 37	0 37	0 37	0 37	0 37
	16	1 08	1 07	1 06	1 04	1 03	1 02	1 00	0 59	0 57	0 55	0 53	0 50	0 47
	17	1 39	1 37	1 35	1 33	1 30	1 27	1 25	1 21	1 18	1 14	1 10	1 05	0 59
	18	2 13	2 10	2 07	2 03	2 00	1 56	1 52	1 47	1 42	1 36	1 30	1 22	1 14
	19	2 51	2 47	2 43	2 39	2 34	2 29	2 23	2 17	2 10	2 02	1 54	1 44	1 32
	20	3 34	3 29	3 25	3 19	3 14	3 08	3 01	2 53	2 45	2 36	2 25	2 12	1 58
	21	4 23	4 18	4 13	4 07	4 01	3 54	3 47	3 38	3 29	3 18	3 06	2 52	2 34
	22	5 19	5 14	5 09	5 03	4 56	4 49	4 42	4 33	4 23	4 12	4 00	3 45	3 26
	23	6 21	6 17	6 11	6 06	6 00	5 53	5 46	5 38	5 29	5 18	5 06	4 52	4 36
	24	7 28	7 24	7 19	7 14	7 09	7 03	6 57	6 50	6 43	6 34	6 24	6 12	5 58
	25	8 36	8 33	8 30	8 26	8 22	8 18	8 13	8 08	8 02	7 55	7 48	7 39	7 29
	26	9 46	9 44	9 40	9 36	9 34	9 30	9 27	9 23	9 19	9 14	9 09	9 03	8 55
	27	10 55	10 54	10 53	10 52	10 51	10 49	10 48	10 46	10 45	10 43	10 41	10 39	10 36
	28	12 03	12 03	12 03	12 04	12 04	12 04	12 05	12 05	12 06	12 06	12 07	12 07	12 08
	29	13 10	13 11	13 13	13 14	13 16	13 18	13 20	13 22	13 25	13 28	13 31	13 35	13 39
	30	14 15	14 18	14 21	14 24	14 27	14 30	14 34	14 38	14 43	14 48	14 54	15 00	15 08
July	1	15 20	15 24	15 27	15 31	15 36	15 41	15 46	15 52	15 58	16 05	16 13	16 23	16 34
	2	16 22	16 27	16 31	16 36	16 42	16 48	16 54	17 01	17 09	17 18	17 29	17 41	17 55
	3	17 22	17 26	17 32	17 37	17 43	17 50	17 57	18 05	18 14	18 25	18 37	18 51	19 07

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	−55°	−50°	−45°	−40°	−35°	−30°	−20°	−10°	0°	+10°	+20°	+30°	+35°	+40°
July	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	4 33	4 16	4 04	3 53	3 44	3 36	3 22	3 11	3 00	2 49	2 37	2 24	2 16	2 07
2	5 40	5 21	5 06	4 54	4 43	4 34	4 18	4 05	3 52	3 39	3 26	3 10	3 01	2 51
3	6 41	6 21	6 04	5 51	5 40	5 30	5 13	4 58	4 44	4 31	4 16	3 59	3 49	3 38
4	7 34	7 13	6 57	6 43	6 32	6 22	6 05	5 50	5 36	5 22	5 07	4 50	4 40	4 29
5	8 18	7 59	7 43	7 31	7 20	7 11	6 54	6 40	6 27	6 14	5 59	5 43	5 34	5 23
6	8 55	8 38	8 24	8 13	8 03	7 55	7 40	7 28	7 16	7 04	6 51	6 36	6 28	6 18
7	9 25	9 11	9 00	8 51	8 43	8 36	8 24	8 13	8 03	7 53	7 42	7 30	7 23	7 14
8	9 51	9 41	9 32	9 25	9 19	9 13	9 04	8 56	8 48	8 40	8 32	8 22	8 17	8 11
9	10 14	10 07	10 01	9 56	9 52	9 49	9 42	9 37	9 31	9 26	9 21	9 14	9 11	9 06
10	10 35	10 31	10 28	10 26	10 24	10 22	10 19	10 17	10 14	10 12	10 09	10 06	10 04	10 02
11	10 55	10 55	10 55	10 55	10 55	10 56	10 56	10 56	10 56	10 57	10 57	10 57	10 57	10 58
12	11 15	11 19	11 22	11 25	11 27	11 29	11 33	11 36	11 39	11 42	11 45	11 49	11 51	11 54
13	11 37	11 44	11 51	11 56	12 00	12 04	12 11	12 17	12 23	12 29	12 35	12 42	12 46	12 51
14	12 01	12 13	12 22	12 29	12 36	12 42	12 52	13 01	13 09	13 17	13 26	13 37	13 43	13 50
15	12 30	12 45	12 57	13 07	13 15	13 23	13 36	13 47	13 58	14 08	14 20	14 33	14 41	14 50
16	13 06	13 24	13 38	13 49	13 59	14 08	14 23	14 37	14 49	15 02	15 15	15 31	15 40	15 50
17	13 50	14 10	14 26	14 39	14 50	14 59	15 16	15 31	15 44	15 58	16 13	16 30	16 40	16 51
18	14 44	15 05	15 21	15 35	15 46	15 56	16 13	16 28	16 42	16 56	17 11	17 28	17 38	17 49
19	15 50	16 10	16 25	16 37	16 48	16 57	17 14	17 28	17 41	17 54	18 08	18 24	18 33	18 44
20	17 05	17 21	17 34	17 45	17 54	18 02	18 16	18 28	18 40	18 51	19 03	19 17	19 25	19 34
21	18 25	18 38	18 48	18 56	19 03	19 09	19 20	19 29	19 38	19 47	19 56	20 06	20 13	20 19
22	19 48	19 56	20 02	20 07	20 12	20 16	20 23	20 29	20 34	20 40	20 46	20 52	20 56	21 01
23	21 11	21 14	21 16	21 18	21 20	21 22	21 24	21 26	21 29	21 31	21 33	21 36	21 37	21 39
24	22 33	22 31	22 29	22 28	22 27	22 26	22 24	22 23	22 22	22 20	22 19	22 18	22 17	22 16
25	23 52	23 46	23 40	23 36	23 32	23 29	23 23	23 18	23 14	23 09	23 04	22 59	22 56	22 52

MOONSET

July	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	13 45	14 02	14 16	14 27	14 37	14 45	15 00	15 13	15 25	15 37	15 49	16 04	16 13	16 22
2	14 25	14 44	15 00	15 13	15 24	15 33	15 49	16 04	16 17	16 30	16 45	17 01	17 11	17 22
3	15 11	15 32	15 48	16 02	16 13	16 23	16 40	16 55	17 09	17 23	17 38	17 55	18 05	18 17
4	16 04	16 25	16 41	16 54	17 06	17 15	17 32	17 47	18 01	18 14	18 29	18 46	18 55	19 07
5	17 03	17 22	17 37	17 49	18 00	18 09	18 24	18 38	18 51	19 03	19 17	19 32	19 41	19 51
6	18 05	18 22	18 35	18 45	18 54	19 02	19 16	19 28	19 39	19 50	20 01	20 15	20 23	20 31
7	19 10	19 23	19 33	19 41	19 49	19 55	20 06	20 16	20 25	20 34	20 43	20 54	21 00	21 07
8	20 15	20 24	20 31	20 38	20 43	20 47	20 56	21 03	21 09	21 16	21 22	21 30	21 35	21 40
9	21 20	21 25	21 30	21 33	21 36	21 39	21 44	21 48	21 52	21 56	22 00	22 05	22 07	22 10
10	22 25	22 26	22 28	22 29	22 30	22 31	22 32	22 33	22 34	22 36	22 37	22 38	22 39	22 40
11	23 30	23 28	23 26	23 25	23 23	23 22	23 20	23 19	23 17	23 15	23 13	23 11	23 10	23 09
12	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 56	23 51	23 46	23 42	23 39
13	0 36	0 30	0 25	0 21	0 18	0 15	0 09	0 04	0 00	.. ..	.. ..	.. ..	.. ..	.. ..
14	1 44	1 34	1 26	1 19	1 13	1 08	1 00	0 52	0 45	0 38	0 30	0 22	0 17	0 11
15	2 52	2 38	2 27	2 18	2 10	2 04	1 52	1 42	1 32	1 22	1 12	1 01	0 54	0 46
16	4 00	3 43	3 30	3 18	3 09	3 01	2 46	2 34	2 22	2 10	1 58	1 44	1 35	1 26
17	5 07	4 47	4 32	4 19	4 08	3 59	3 43	3 29	3 15	3 02	2 48	2 32	2 22	2 12
18	6 09	5 48	5 32	5 19	5 07	4 57	4 40	4 25	4 11	3 57	3 43	3 25	3 15	3 04
19	7 04	6 44	6 28	6 15	6 04	5 55	5 38	5 23	5 10	4 56	4 41	4 24	4 15	4 03
20	7 51	7 33	7 19	7 08	6 58	6 49	6 34	6 21	6 09	5 57	5 43	5 28	5 19	5 09
21	8 29	8 16	8 05	7 55	7 48	7 41	7 28	7 18	7 08	6 57	6 47	6 34	6 27	6 18
22	9 02	8 53	8 45	8 39	8 33	8 28	8 20	8 12	8 05	7 58	7 50	7 41	7 36	7 30
23	9 31	9 26	9 22	9 18	9 15	9 13	9 08	9 04	9 00	8 56	8 52	8 47	8 44	8 41
24	9 57	9 57	9 56	9 56	9 56	9 55	9 55	9 54	9 54	9 54	9 53	9 52	9 52	9 52
25	10 22	10 26	10 30	10 32	10 35	10 37	10 40	10 44	10 46	10 49	10 53	10 56	10 58	11 01

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
 MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 1	2 07	2 04	1 59	1 55	1 50	1 45	1 39	1 33	1 26	1 19	1 10	1 00	0 48	0 34
2	2 51	2 46	2 42	2 36	2 31	2 25	2 18	2 10	2 02	1 53	1 42	1 29	1 15	0 57
3	3 38	3 33	3 28	3 22	3 16	3 09	3 02	2 54	2 44	2 34	2 22	2 08	1 51	1 30
4	4 29	4 24	4 19	4 13	4 06	4 00	3 52	3 44	3 34	3 23	3 11	2 56	2 39	2 17
5	5 23	5 18	5 13	5 07	5 01	4 55	4 47	4 39	4 30	4 20	4 08	3 54	3 38	3 17
6	6 18	6 14	6 09	6 04	5 59	5 53	5 47	5 39	5 31	5 22	5 12	5 00	4 46	4 28
7	7 14	7 11	7 07	7 03	6 58	6 53	6 48	6 42	6 36	6 28	6 20	6 10	5 59	5 45
8	8 11	8 08	8 05	8 02	7 58	7 55	7 50	7 46	7 41	7 35	7 29	7 22	7 14	7 04
9	9 06	9 05	9 03	9 01	8 58	8 56	8 53	8 50	8 47	8 43	8 39	8 34	8 29	8 23
10	10 02	10 01	10 00	9 59	9 58	9 57	9 56	9 54	9 53	9 51	9 49	9 47	9 44	9 42
11	10 58	10 58	10 58	10 58	10 58	10 58	10 58	10 59	10 59	10 59	10 59	11 00	11 00	11 00
12	11 54	11 55	11 56	11 57	11 59	12 00	12 02	12 04	12 06	12 08	12 10	12 13	12 16	12 20
13	12 51	12 53	12 55	12 58	13 00	13 03	13 06	13 10	13 13	13 17	13 22	13 27	13 34	13 41
14	13 50	13 53	13 56	13 59	14 03	14 07	14 12	14 17	14 22	14 28	14 35	14 43	14 53	15 04
15	14 50	14 53	14 58	15 02	15 07	15 12	15 18	15 25	15 32	15 40	15 49	16 00	16 12	16 27
16	15 50	15 55	16 00	16 05	16 11	16 17	16 24	16 32	16 41	16 50	17 01	17 15	17 30	17 49
17	16 51	16 56	17 01	17 07	17 13	17 20	17 28	17 36	17 46	17 57	18 09	18 24	18 42	19 04
18	17 49	17 54	18 00	18 06	18 12	18 19	18 27	18 35	18 45	18 56	19 08	19 23	19 41	20 03
19	18 44	18 49	18 54	18 59	19 05	19 12	19 19	19 27	19 35	19 45	19 57	20 10	20 26	20 45
20	19 34	19 38	19 42	19 47	19 52	19 58	20 03	20 10	20 17	20 25	20 35	20 45	20 58	21 13
21	20 19	20 23	20 26	20 29	20 33	20 37	20 42	20 46	20 52	20 58	21 05	21 12	21 21	21 32
22	21 01	21 03	21 05	21 07	21 09	21 12	21 15	21 18	21 21	21 25	21 29	21 34	21 39	21 45
23	21 39	21 40	21 41	21 42	21 42	21 43	21 45	21 46	21 47	21 49	21 50	21 52	21 54	21 56
24	22 16	22 15	22 15	22 14	22 14	22 13	22 13	22 12	22 12	22 11	22 10	22 09	22 08	22 07
25	22 52	22 51	22 49	22 47	22 45	22 43	22 41	22 39	22 36	22 33	22 30	22 26	22 22	22 17

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 1	16 22	16 27	16 31	16 36	16 42	16 48	16 54	17 01	17 09	17 18	17 29	17 41	17 55	18 12	
2	17 22	17 26	17 32	17 37	17 43	17 50	17 57	18 05	18 14	18 25	18 37	18 51	19 07	19 28	
3	18 17	18 22	18 27	18 33	18 39	18 46	18 54	19 02	19 12	19 22	19 35	19 50	20 07	20 29	
4	19 07	19 11	19 17	19 22	19 29	19 35	19 43	19 51	20 00	20 11	20 23	20 37	20 53	21 14	
5	19 51	19 56	20 01	20 06	20 11	20 18	20 24	20 32	20 40	20 49	21 00	21 12	21 27	21 45	
6	20 31	20 35	20 39	20 44	20 49	20 54	21 00	21 06	21 13	21 21	21 30	21 40	21 52	22 06	
7	21 07	21 10	21 14	21 17	21 21	21 25	21 30	21 35	21 40	21 46	21 53	22 01	22 10	22 21	
8	21 40	21 42	21 44	21 47	21 50	21 53	21 56	21 59	22 03	22 08	22 13	22 18	22 24	22 32	
9	22 10	22 12	22 13	22 15	22 16	22 18	22 20	22 22	22 24	22 27	22 29	22 33	22 36	22 40	
10	22 40	22 40	22 41	22 41	22 41	22 42	22 42	22 43	22 44	22 44	22 45	22 46	22 47	22 48	
11	23 09	23 08	23 08	23 07	23 06	23 06	23 05	23 04	23 03	23 02	23 01	22 59	22 58	22 56	
12	23 39	23 37	23 36	23 34	23 32	23 30	23 28	23 26	23 23	23 20	23 17	23 13	23 09	23 04	
13	.. ..	.. ..	.. ..	.. ..	.. ..	23 57	23 53	23 49	23 45	23 40	23 35	23 28	23 21	23 13	
14	0 11	0 08	0 06	0 03	0 00	.. ..	.. ..	.. ..	.. ..	.. ..	23 56	23 47	23 37	23 26	
15	0 46	0 43	0 39	0 35	0 31	0 27	0 22	0 16	0 10	0 04	.. ..	.. ..	23 59	23 43	
16	1 26	1 22	1 17	1 13	1 07	1 02	0 56	0 49	0 41	0 33	0 23	0 12	.. ..	.. ..
17	2 12	2 07	2 02	1 56	1 50	1 44	1 36	1 29	1 20	1 10	0 58	0 45	0 29	0 09	
18	3 04	2 59	2 53	2 48	2 41	2 34	2 26	2 18	2 08	1 57	1 45	1 30	1 12	0 50	
19	4 03	3 58	3 53	3 47	3 41	3 34	3 26	3 18	3 08	2 58	2 45	2 30	2 13	1 51	
20	5 09	5 04	4 59	4 54	4 49	4 42	4 35	4 28	4 19	4 10	3 59	3 46	3 30	3 12	
21	6 18	6 15	6 11	6 06	6 02	5 57	5 51	5 45	5 38	5 31	5 22	5 12	5 00	4 46	
22	7 30	7 27	7 24	7 21	7 18	7 15	7 11	7 06	7 02	6 56	6 51	6 44	6 36	6 26	
23	8 41	8 40	8 38	8 37	8 35	8 33	8 31	8 29	8 26	8 23	8 20	8 17	8 12	8 08	
24	9 52	9 52	9 51	9 51	9 51	9 51	9 50	9 50	9 50	9 49	9 49	9 48	9 48	9 47	
25	11 01	11 02	11 03	11 04	11 05	11 07	11 08	11 10	11 12	11 14	11 16	11 18	11 21	11 25	

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 24	22 33	22 31	22 29	22 28	22 27	22 26	22 24	22 23	22 22	22 20	22 19	22 18	22 17	22 16
25	23 52	23 46	23 40	23 36	23 32	23 29	23 23	23 18	23 14	23 09	23 04	22 59	22 56	22 52
26	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 58	23 50	23 41	23 35	23 29
27	1 09	0 58	0 50	0 42	0 36	0 31	0 21	0 13	0 05	.. ..	.. ..	.. ..	.. ..	.. ..
28	2 23	2 08	1 56	1 46	1 38	1 31	1 18	1 07	0 57	0 47	0 36	0 24	0 17	0 09
29	3 32	3 14	2 59	2 48	2 38	2 29	2 14	2 01	1 49	1 36	1 24	1 09	1 00	0 51
30	4 34	4 14	3 58	3 45	3 34	3 25	3 08	2 54	2 40	2 27	2 13	1 56	1 47	1 36
31	5 29	5 09	4 52	4 39	4 27	4 18	4 00	3 46	3 32	3 18	3 03	2 46	2 36	2 25
Aug. 1	6 16	5 56	5 40	5 27	5 16	5 07	4 50	4 36	4 22	4 09	3 54	3 37	3 28	3 17
2	6 55	6 37	6 23	6 11	6 01	5 52	5 37	5 24	5 11	4 59	4 45	4 30	4 21	4 11
3	7 28	7 13	7 00	6 50	6 42	6 34	6 21	6 09	5 59	5 48	5 36	5 23	5 15	5 07
4	7 55	7 43	7 34	7 26	7 19	7 13	7 02	6 53	6 44	6 36	6 26	6 16	6 10	6 03
5	8 19	8 11	8 04	7 58	7 53	7 49	7 41	7 35	7 28	7 22	7 15	7 08	7 03	6 58
6	8 41	8 36	8 32	8 29	8 26	8 23	8 19	8 15	8 11	8 08	8 04	8 00	7 57	7 54
7	9 01	9 00	8 59	8 58	8 57	8 57	8 55	8 55	8 54	8 53	8 52	8 51	8 50	8 50
8	9 21	9 23	9 25	9 27	9 28	9 30	9 32	9 34	9 36	9 38	9 40	9 42	9 44	9 45
9	9 42	9 48	9 53	9 57	10 01	10 04	10 09	10 14	10 19	10 23	10 28	10 34	10 37	10 41
10	10 05	10 14	10 22	10 29	10 34	10 39	10 48	10 56	11 03	11 10	11 18	11 27	11 32	11 38
11	10 31	10 44	10 55	11 04	11 11	11 18	11 30	11 40	11 49	11 59	12 09	12 21	12 28	12 36
12	11 03	11 19	11 32	11 43	11 52	12 00	12 14	12 27	12 38	12 50	13 03	13 17	13 25	13 35
13	11 41	12 00	12 15	12 27	12 38	12 47	13 03	13 17	13 30	13 44	13 58	14 14	14 23	14 34
14	12 29	12 50	13 06	13 19	13 30	13 40	13 57	14 11	14 25	14 39	14 54	15 11	15 21	15 32
15	13 28	13 48	14 04	14 17	14 28	14 38	14 54	15 09	15 23	15 36	15 51	16 08	16 17	16 28
16	14 38	14 56	15 10	15 22	15 32	15 41	15 56	16 09	16 21	16 34	16 47	17 02	17 11	17 21
17	15 56	16 10	16 22	16 32	16 40	16 47	16 59	17 10	17 20	17 31	17 41	17 54	18 01	18 09

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 24	9 57	9 57	9 56	9 56	9 56	9 55	9 55	9 54	9 54	9 54	9 53	9 52	9 52	9 52
25	10 22	10 26	10 30	10 32	10 35	10 37	10 40	10 44	10 46	10 49	10 53	10 56	10 58	11 01
26	10 48	10 57	11 03	11 09	11 14	11 18	11 26	11 32	11 38	11 44	11 51	11 59	12 03	12 08
27	11 17	11 29	11 39	11 47	11 54	12 01	12 11	12 21	12 30	12 39	12 49	12 59	13 06	13 13
28	11 49	12 05	12 17	12 28	12 37	12 45	12 58	13 10	13 22	13 33	13 45	13 59	14 07	14 16
29	12 26	12 44	12 59	13 11	13 22	13 31	13 47	14 01	14 13	14 26	14 40	14 56	15 05	15 16
30	13 09	13 29	13 45	13 59	14 10	14 20	14 37	14 51	15 05	15 19	15 34	15 50	16 00	16 11
31	13 59	14 20	14 36	14 49	15 01	15 10	15 27	15 42	15 56	16 10	16 25	16 42	16 51	17 03
Aug. 1	14 55	15 14	15 30	15 42	15 53	16 03	16 19	16 33	16 46	16 59	17 13	17 29	17 38	17 49
2	15 55	16 13	16 26	16 38	16 47	16 56	17 10	17 23	17 34	17 46	17 58	18 13	18 21	18 30
3	16 59	17 13	17 24	17 33	17 41	17 48	18 01	18 11	18 21	18 31	18 41	18 53	19 00	19 07
4	18 03	18 14	18 22	18 30	18 36	18 41	18 50	18 58	19 06	19 13	19 21	19 30	19 35	19 41
5	19 08	19 15	19 21	19 25	19 29	19 33	19 39	19 44	19 49	19 54	19 59	20 05	20 09	20 13
6	20 13	20 16	20 19	20 21	20 23	20 24	20 27	20 30	20 32	20 34	20 36	20 39	20 41	20 42
7	21 18	21 17	21 17	21 16	21 16	21 16	21 15	21 15	21 14	21 13	21 13	21 12	21 12	21 11
8	22 23	22 19	22 15	22 12	22 10	22 07	22 03	22 00	21 56	21 53	21 50	21 46	21 43	21 41
9	23 29	23 21	23 14	23 08	23 04	23 00	22 52	22 46	22 40	22 34	22 28	22 20	22 16	22 12
10	.. ..	.. ..	.. ..	.. ..	23 59	23 53	23 43	23 34	23 25	23 17	23 08	22 57	22 51	22 45
11	0 35	0 23	0 14	0 06	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 50	23 37	23 30	23 21
12	1 42	1 27	1 14	1 04	0 56	0 48	0 35	0 23	0 13	0 02	.. ..	.. ..	.. ..	.. ..
13	2 48	2 30	2 15	2 03	1 53	1 44	1 29	1 15	1 03	0 50	0 37	0 22	0 13	0 03
14	3 51	3 31	3 15	3 02	2 51	2 41	2 24	2 10	1 56	1 43	1 28	1 11	1 02	0 51
15	4 49	4 28	4 12	3 59	3 48	3 38	3 21	3 06	2 52	2 39	2 24	2 07	1 57	1 45
16	5 39	5 20	5 05	4 53	4 43	4 33	4 18	4 04	3 51	3 37	3 23	3 07	2 58	2 47
17	6 22	6 06	5 54	5 43	5 34	5 27	5 13	5 01	4 50	4 38	4 26	4 12	4 04	3 54

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

51

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 24	22 16	22 15	22 15	22 14	22 14	22 13	22 13	22 12	22 12	22 11	22 10	22 09	22 08	22 07
25	22 52	22 51	22 49	22 47	22 45	22 43	22 41	22 39	22 36	22 33	22 30	22 26	22 22	22 17
26	23 29	23 27	23 24	23 21	23 18	23 14	23 11	23 06	23 02	22 57	22 51	22 45	22 37	22 29
27	.. ..	.. ..	.. ..	23 57	23 53	23 48	23 43	23 37	23 31	23 24	23 16	23 07	22 56	22 44
28	0 09	0 05	0 01	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 56	23 46	23 34	23 20	23 04
29	0 51	0 46	0 42	0 37	0 31	0 26	0 19	0 12	0 04	.. ..	.. ..	.. ..	23 52	23 33
30	1 36	1 31	1 26	1 21	1 14	1 08	1 01	0 53	0 44	0 34	0 22	0 09	.. ..	.. ..
31	2 25	2 20	2 14	2 09	2 02	1 56	1 48	1 40	1 30	1 19	1 07	0 53	0 35	0 14
Aug. 1	3 17	3 12	3 07	3 01	2 55	2 48	2 41	2 32	2 23	2 13	2 01	1 46	1 29	1 08
2	4 11	4 07	4 02	3 56	3 51	3 45	3 38	3 30	3 22	3 12	3 02	2 49	2 34	2 15
3	5 07	5 03	4 58	4 54	4 49	4 44	4 38	4 32	4 25	4 17	4 07	3 57	3 44	3 29
4	6 03	5 59	5 56	5 53	5 49	5 45	5 40	5 35	5 29	5 23	5 16	5 08	4 58	4 47
5	6 58	6 56	6 54	6 51	6 49	6 46	6 42	6 39	6 35	6 31	6 26	6 20	6 13	6 06
6	7 54	7 53	7 51	7 50	7 48	7 47	7 45	7 43	7 41	7 38	7 35	7 32	7 29	7 24
7	8 50	8 49	8 49	8 48	8 48	8 48	8 47	8 47	8 47	8 46	8 45	8 45	8 44	8 43
8	9 45	9 46	9 47	9 47	9 48	9 49	9 50	9 51	9 52	9 54	9 55	9 57	9 59	10 01
9	10 41	10 43	10 45	10 47	10 49	10 51	10 53	10 56	10 59	11 02	11 06	11 10	11 15	11 21
10	11 38	11 41	11 44	11 47	11 50	11 53	11 57	12 01	12 06	12 11	12 17	12 24	12 32	12 41
11	12 36	12 40	12 43	12 47	12 52	12 57	13 02	13 07	13 14	13 21	13 29	13 39	13 49	14 03
12	13 35	13 39	13 44	13 49	13 54	14 00	14 06	14 13	14 21	14 30	14 40	14 52	15 06	15 24
13	14 34	14 39	14 44	14 50	14 56	15 02	15 10	15 18	15 27	15 37	15 49	16 03	16 20	16 40
14	15 32	15 37	15 43	15 49	15 55	16 02	16 10	16 18	16 28	16 39	16 51	17 06	17 24	17 46
15	16 28	16 33	16 39	16 44	16 50	16 57	17 05	17 13	17 22	17 33	17 45	17 59	18 16	18 37
16	17 21	17 25	17 30	17 35	17 40	17 46	17 53	18 00	18 08	18 18	18 28	18 40	18 54	19 11
17	18 09	18 12	18 16	18 20	18 25	18 30	18 35	18 41	18 47	18 54	19 02	19 12	19 22	19 35

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 24	9 52	9 52	9 51	9 51	9 51	9 51	9 50	9 50	9 50	9 49	9 49	9 48	9 48	9 47
25	11 01	11 02	11 03	11 04	11 05	11 07	11 08	11 10	11 12	11 14	11 16	11 18	11 21	11 25
26	12 08	12 10	12 12	12 15	12 17	12 20	12 24	12 27	12 31	12 35	12 40	12 46	12 52	13 00
27	13 13	13 16	13 20	13 23	13 27	13 32	13 36	13 42	13 47	13 54	14 01	14 10	14 20	14 31
28	14 16	14 20	14 24	14 29	14 34	14 40	14 46	14 52	15 00	15 08	15 18	15 29	15 42	15 58
29	15 16	15 20	15 25	15 31	15 37	15 43	15 50	15 58	16 06	16 16	16 28	16 41	16 57	17 16
30	16 11	16 16	16 22	16 27	16 34	16 41	16 48	16 56	17 06	17 16	17 29	17 43	18 00	18 22
31	17 03	17 07	17 13	17 19	17 25	17 32	17 39	17 47	17 57	18 07	18 20	18 34	18 51	19 12
Aug. 1	17 49	17 53	17 58	18 04	18 10	18 16	18 23	18 31	18 39	18 49	19 00	19 13	19 29	19 48
2	18 30	18 34	18 39	18 43	18 49	18 54	19 00	19 07	19 14	19 23	19 32	19 44	19 56	20 12
3	19 07	19 11	19 14	19 18	19 23	19 27	19 32	19 38	19 44	19 50	19 58	20 07	20 17	20 29
4	19 41	19 44	19 47	19 50	19 53	19 56	20 00	20 04	20 08	20 13	20 19	20 25	20 33	20 41
5	20 13	20 14	20 16	20 18	20 20	20 22	20 25	20 27	20 30	20 33	20 37	20 41	20 46	20 51
6	20 42	20 43	20 44	20 45	20 46	20 47	20 48	20 49	20 50	20 52	20 53	20 55	20 57	20 59
7	21 11	21 11	21 11	21 11	21 11	21 10	21 10	21 10	21 09	21 09	21 09	21 08	21 08	21 07
8	21 41	21 40	21 39	21 37	21 36	21 34	21 33	21 31	21 29	21 27	21 24	21 22	21 18	21 15
9	22 12	22 09	22 07	22 05	22 02	22 00	21 57	21 53	21 50	21 46	21 41	21 36	21 30	21 24
10	22 45	22 42	22 38	22 35	22 31	22 27	22 23	22 18	22 13	22 07	22 01	21 53	21 45	21 35
11	23 21	23 18	23 13	23 09	23 04	22 59	22 54	22 48	22 41	22 33	22 24	22 15	22 03	21 49
12	.. ..	23 58	23 54	23 48	23 43	23 37	23 30	23 23	23 15	23 05	22 55	22 42	22 28	22 10
13	0 03	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 57	23 46	23 34	23 20	23 03	22 42
14	0 51	0 46	0 40	0 35	0 29	0 22	0 14	0 06	.. ..	.. ..	.. ..	.. ..	23 54	23 31
15	1 45	1 40	1 35	1 29	1 23	1 16	1 08	0 59	0 50	0 39	0 26	0 11	.. ..	.. ..
16	2 47	2 42	2 37	2 31	2 25	2 19	2 11	2 03	1 54	1 44	1 32	1 18	1 02	0 41
17	3 54	3 50	3 46	3 41	3 36	3 30	3 24	3 17	3 09	3 00	2 50	2 39	2 25	2 09

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	−55°	−50°	−45°	−40°	−35°	−30°	−20°	−10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Aug. 16	14 38	14 56	15 10	15 22	15 32	15 41	15 56	16 09	16 21	16 34	16 47	17 02	17 11	17 21
17	15 56	16 10	16 22	16 32	16 40	16 47	16 59	17 10	17 20	17 31	17 41	17 54	18 01	18 09
18	17 19	17 29	17 37	17 44	17 50	17 55	18 04	18 11	18 19	18 26	18 34	18 42	18 47	18 53
19	18 44	18 50	18 54	18 57	19 00	19 03	19 08	19 12	19 16	19 19	19 24	19 28	19 31	19 34
20	20 09	20 10	20 10	20 10	20 10	20 10	20 11	20 11	20 11	20 11	20 12	20 12	20 12	20 13
21	21 33	21 28	21 24	21 21	21 19	21 16	21 12	21 09	21 06	21 02	20 59	20 55	20 53	20 51
22	22 53	22 44	22 37	22 31	22 25	22 21	22 13	22 06	21 59	21 53	21 46	21 38	21 34	21 29
23	.. ..	23 57	23 46	23 37	23 30	23 23	23 11	23 02	22 52	22 43	22 33	22 22	22 16	22 08
24	0 10	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 56	23 45	23 33	23 21	23 07	22 59	22 50
25	1 22	1 05	0 52	0 41	0 31	0 23	0 09	.. ..	.. ..	.. ..	.. ..	23 54	23 45	23 35
26	2 28	2 08	1 53	1 40	1 30	1 20	1 04	0 50	0 37	0 24	0 10	.. ..	.. ..	.. ..
27	3 25	3 05	2 49	2 35	2 24	2 14	1 57	1 43	1 29	1 15	1 00	0 44	0 34	0 23
28	4 15	3 54	3 38	3 25	3 14	3 04	2 48	2 33	2 19	2 06	1 51	1 34	1 25	1 13
29	4 56	4 37	4 22	4 10	4 00	3 51	3 35	3 21	3 08	2 56	2 42	2 26	2 17	2 07
30	5 30	5 14	5 01	4 50	4 41	4 33	4 20	4 07	3 56	3 45	3 32	3 19	3 10	3 01
31	5 59	5 46	5 36	5 27	5 19	5 13	5 01	4 51	4 42	4 33	4 22	4 11	4 04	3 57
Sept. 1	6 24	6 14	6 07	6 00	5 55	5 50	5 41	5 34	5 26	5 19	5 12	5 03	4 58	4 52
2	6 46	6 40	6 35	6 31	6 28	6 24	6 19	6 14	6 10	6 05	6 00	5 55	5 52	5 48
3	7 07	7 05	7 03	7 01	6 59	6 58	6 56	6 54	6 52	6 50	6 48	6 46	6 45	6 44
4	7 27	7 28	7 29	7 30	7 31	7 31	7 32	7 33	7 34	7 35	7 36	7 38	7 38	7 39
5	7 48	7 52	7 56	8 00	8 02	8 05	8 09	8 13	8 17	8 21	8 25	8 29	8 32	8 35
6	8 10	8 18	8 25	8 31	8 36	8 40	8 47	8 54	9 00	9 07	9 14	9 21	9 26	9 31
7	8 34	8 46	8 56	9 04	9 11	9 17	9 27	9 37	9 45	9 54	10 04	10 15	10 21	10 28
8	9 03	9 18	9 30	9 41	9 49	9 57	10 10	10 22	10 33	10 43	10 55	11 09	11 16	11 25
9	9 38	9 56	10 10	10 22	10 32	10 41	10 56	11 09	11 22	11 35	11 48	12 04	12 13	12 23

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Aug. 16	5 39	5 20	5 05	4 53	4 43	4 33	4 18	4 04	3 51	3 37	3 23	3 07	2 58	2 47
17	6 22	6 06	5 54	5 43	5 34	5 27	5 13	5 01	4 50	4 38	4 26	4 12	4 04	3 54
18	6 58	6 47	6 37	6 29	6 23	6 17	6 06	5 57	5 48	5 39	5 30	5 19	5 13	5 06
19	7 30	7 23	7 17	7 12	7 08	7 04	6 57	6 51	6 46	6 40	6 34	6 27	6 23	6 19
20	7 58	7 55	7 53	7 52	7 50	7 49	7 46	7 44	7 42	7 40	7 38	7 35	7 34	7 32
21	8 25	8 27	8 28	8 30	8 31	8 32	8 34	8 36	8 37	8 39	8 40	8 42	8 43	8 44
22	8 51	8 58	9 03	9 08	9 12	9 15	9 21	9 26	9 31	9 36	9 41	9 47	9 51	9 54
23	9 20	9 31	9 39	9 47	9 53	9 58	10 08	10 17	10 24	10 32	10 41	10 51	10 56	11 03
24	9 51	10 06	10 18	10 27	10 36	10 43	10 56	11 07	11 17	11 28	11 39	11 52	11 59	12 08
25	10 27	10 45	10 59	11 11	11 21	11 29	11 44	11 58	12 10	12 22	12 36	12 51	13 00	13 10
26	11 09	11 28	11 44	11 57	12 08	12 18	12 34	12 49	13 02	13 16	13 30	13 46	13 56	14 07
27	11 56	12 17	12 33	12 46	12 58	13 08	13 25	13 39	13 53	14 07	14 22	14 39	14 48	15 00
28	12 50	13 10	13 26	13 39	13 50	13 59	14 16	14 30	14 43	14 57	15 11	15 27	15 36	15 47
29	13 49	14 07	14 21	14 33	14 43	14 51	15 06	15 19	15 32	15 44	15 57	16 11	16 20	16 30
30	14 51	15 06	15 18	15 28	15 36	15 44	15 57	16 08	16 18	16 29	16 40	16 53	17 00	17 08
31	15 54	16 06	16 16	16 24	16 30	16 36	16 46	16 55	17 04	17 12	17 21	17 31	17 36	17 43
Sept. 1	16 59	17 07	17 14	17 19	17 24	17 28	17 35	17 42	17 47	17 53	17 59	18 06	18 10	18 15
2	18 04	18 08	18 12	18 15	18 17	18 20	18 24	18 27	18 30	18 33	18 37	18 41	18 43	18 45
3	19 09	19 09	19 10	19 10	19 11	19 11	19 12	19 12	19 13	19 13	19 13	19 14	19 14	19 15
4	20 14	20 11	20 08	20 06	20 04	20 02	20 00	19 57	19 55	19 53	19 50	19 47	19 46	19 44
5	21 19	21 12	21 07	21 02	20 58	20 54	20 48	20 43	20 38	20 33	20 27	20 21	20 18	20 14
6	22 25	22 14	22 05	21 58	21 52	21 47	21 38	21 30	21 22	21 14	21 06	20 57	20 52	20 46
7	23 30	23 16	23 05	22 55	22 47	22 40	22 28	22 18	22 08	21 58	21 47	21 35	21 28	21 21
8	.. ..	.. ..	.. ..	23 53	23 43	23 35	23 20	23 08	22 56	22 44	22 32	22 17	22 09	21 59
9	0 35	0 18	0 04	.. ..	.. ..	.. ..	.. ..	.. ..	23 47	23 33	23 19	23 03	22 54	22 43

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Aug. 16	17 21	17 25	17 30	17 35	17 40	17 46	17 53	18 00	18 08	18 18	18 28	18 40	18 54	19 11
17	18 09	18 12	18 16	18 20	18 25	18 30	18 35	18 41	18 47	18 54	19 02	19 12	19 22	19 35
18	18 53	18 56	18 58	19 01	19 04	19 08	19 11	19 15	19 20	19 24	19 30	19 36	19 43	19 52
19	19 34	19 35	19 37	19 38	19 40	19 42	19 44	19 46	19 48	19 50	19 53	19 57	20 00	20 04
20	20 13	20 13	20 13	20 13	20 13	20 13	20 14	20 14	20 14	20 14	20 15	20 15	20 15	20 16
21	20 51	20 49	20 48	20 47	20 46	20 44	20 43	20 41	20 39	20 37	20 35	20 33	20 30	20 26
22	21 29	21 27	21 24	21 22	21 19	21 16	21 13	21 09	21 06	21 01	20 57	20 51	20 45	20 38
23	22 08	22 05	22 02	21 58	21 54	21 50	21 45	21 40	21 34	21 28	21 21	21 13	21 03	20 52
24	22 50	22 46	22 42	22 37	22 32	22 27	22 21	22 14	22 07	21 59	21 49	21 39	21 26	21 11
25	23 35	23 30	23 25	23 20	23 14	23 08	23 01	22 53	22 45	22 35	22 24	22 11	21 56	21 37
26	.. ..	.. ..	.. ..	.. ..	.. ..	23 54	23 46	23 38	23 29	23 18	23 06	22 52	22 35	22 14
27	0 23	0 18	0 12	0 07	0 01	.. ..	.. ..	.. ..	.. ..	.. ..	23 57	23 43	23 25	23 04
28	1 13	1 09	1 03	0 58	0 51	0 45	0 37	0 29	0 20	0 09	.. ..	.. ..	.. ..	.. ..
29	2 07	2 02	1 57	1 52	1 46	1 39	1 32	1 25	1 16	1 06	0 55	0 42	0 26	0 07
30	3 01	2 57	2 53	2 48	2 43	2 37	2 31	2 24	2 17	2 08	1 59	1 47	1 34	1 18
31	3 57	3 53	3 50	3 46	3 42	3 37	3 32	3 27	3 21	3 14	3 06	2 57	2 47	2 34
Sept. 1	4 52	4 50	4 47	4 44	4 41	4 38	4 34	4 30	4 26	4 21	4 15	4 08	4 01	3 52
2	5 48	5 46	5 45	5 43	5 41	5 39	5 37	5 34	5 31	5 28	5 25	5 21	5 16	5 11
3	6 44	6 43	6 42	6 42	6 41	6 40	6 39	6 38	6 37	6 36	6 34	6 33	6 31	6 29
4	7 39	7 39	7 40	7 40	7 41	7 41	7 42	7 42	7 43	7 43	7 44	7 45	7 46	7 47
5	8 35	8 36	8 38	8 39	8 41	8 43	8 44	8 47	8 49	8 52	8 54	8 58	9 02	9 06
6	9 31	9 33	9 36	9 38	9 41	9 44	9 48	9 51	9 55	10 00	10 05	10 11	10 18	10 26
7	10 28	10 31	10 35	10 38	10 42	10 46	10 51	10 56	11 02	11 09	11 16	11 24	11 34	11 46
8	11 25	11 29	11 34	11 38	11 43	11 49	11 55	12 01	12 08	12 17	12 26	12 37	12 50	13 05
9	12 23	12 28	12 33	12 38	12 44	12 50	12 57	13 05	13 13	13 23	13 34	13 47	14 03	14 22

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Aug. 16	2 47	2 42	2 37	2 31	2 25	2 19	2 11	2 03	1 54	1 44	1 32	1 18	1 02	0 41
17	3 54	3 50	3 46	3 41	3 36	3 30	3 24	3 17	3 09	3 00	2 50	2 39	2 25	2 09
18	5 06	5 02	4 59	4 55	4 51	4 47	4 42	4 37	4 31	4 25	4 17	4 09	3 59	3 47
19	6 19	6 17	6 15	6 12	6 10	6 07	6 04	6 01	5 57	5 53	5 49	5 43	5 37	5 30
20	7 32	7 31	7 30	7 29	7 29	7 27	7 26	7 25	7 24	7 22	7 21	7 19	7 16	7 14
21	8 44	8 45	8 45	8 46	8 46	8 47	8 48	8 48	8 49	8 50	8 51	8 53	8 54	8 56
22	9 54	9 56	9 58	10 00	10 02	10 04	10 07	10 10	10 13	10 16	10 20	10 24	10 29	10 35
23	11 03	11 05	11 08	11 12	11 15	11 19	11 23	11 28	11 33	11 38	11 45	11 52	12 01	12 11
24	12 08	12 12	12 16	12 20	12 25	12 30	12 35	12 42	12 48	12 56	13 05	13 15	13 27	13 41
25	13 10	13 14	13 19	13 24	13 30	13 36	13 42	13 50	13 58	14 07	14 18	14 31	14 46	15 04
26	14 07	14 12	14 17	14 23	14 29	14 36	14 43	14 51	15 00	15 11	15 23	15 37	15 54	16 14
27	15 00	15 05	15 10	15 16	15 22	15 29	15 36	15 45	15 54	16 05	16 17	16 31	16 48	17 10
28	15 47	15 52	15 57	16 03	16 08	16 15	16 22	16 30	16 39	16 49	17 00	17 14	17 30	17 50
29	16 30	16 34	16 39	16 44	16 49	16 55	17 01	17 08	17 16	17 25	17 35	17 47	18 01	18 17
30	17 08	17 12	17 16	17 20	17 24	17 29	17 35	17 40	17 47	17 54	18 03	18 12	18 23	18 36
31	17 43	17 46	17 49	17 52	17 56	17 59	18 04	18 08	18 13	18 19	18 25	18 32	18 40	18 50
Sept. 1	18 15	18 17	18 19	18 21	18 24	18 26	18 29	18 32	18 36	18 40	18 44	18 49	18 54	19 01
2	18 45	18 46	18 47	18 49	18 50	18 51	18 53	18 55	18 56	18 58	19 01	19 03	19 06	19 10
3	19 15	19 15	19 15	19 15	19 15	19 15	19 15	19 16	19 16	19 16	19 16	19 17	19 17	19 18
4	19 44	19 43	19 42	19 41	19 40	19 39	19 38	19 37	19 35	19 34	19 32	19 30	19 28	19 25
5	20 14	20 12	20 10	20 08	20 06	20 04	20 01	19 59	19 56	19 52	19 48	19 44	19 39	19 34
6	20 46	20 43	20 40	20 37	20 34	20 31	20 27	20 22	20 18	20 13	20 07	20 00	19 53	19 44
7	21 21	21 17	21 13	21 09	21 05	21 00	20 55	20 50	20 43	20 36	20 29	20 20	20 09	19 57
8	21 59	21 55	21 51	21 46	21 40	21 35	21 29	21 22	21 14	21 05	20 55	20 44	20 31	20 15
9	22 43	22 38	22 33	22 28	22 22	22 15	22 08	22 00	21 51	21 41	21 30	21 17	21 01	20 41

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Sept. 8	9 03	9 18	9 30	9 41	9 49	9 57	10 10	10 22	10 33	10 43	10 55	11 09	11 16	11 25
9	9 38	9 56	10 10	10 22	10 32	10 41	10 56	11 09	11 22	11 35	11 48	12 04	12 13	12 23
10	10 20	10 40	10 56	11 09	11 20	11 29	11 46	12 00	12 14	12 28	12 42	12 59	13 09	13 20
11	11 13	11 33	11 49	12 02	12 13	12 23	12 40	12 55	13 08	13 22	13 37	13 54	14 04	14 15
12	12 15	12 34	12 49	13 02	13 12	13 22	13 38	13 52	14 05	14 18	14 32	14 48	14 57	15 07
13	13 27	13 44	13 57	14 07	14 17	14 25	14 39	14 51	15 02	15 13	15 26	15 39	15 47	15 56
14	14 47	14 59	15 09	15 17	15 25	15 31	15 42	15 51	16 00	16 09	16 18	16 29	16 35	16 42
15	16 11	16 18	16 25	16 30	16 35	16 39	16 45	16 51	16 57	17 03	17 09	17 16	17 20	17 24
16	17 37	17 39	17 42	17 44	17 45	17 47	17 49	17 52	17 54	17 56	17 58	18 01	18 03	18 04
17	19 03	19 00	18 59	18 57	18 56	18 55	18 53	18 51	18 50	18 49	18 47	18 45	18 44	18 43
18	20 27	20 20	20 14	20 10	20 06	20 02	19 56	19 51	19 46	19 41	19 35	19 30	19 26	19 22
19	21 49	21 37	21 28	21 20	21 14	21 08	20 58	20 49	20 41	20 33	20 24	20 15	20 09	20 03
20	23 06	22 50	22 38	22 28	22 19	22 11	21 58	21 46	21 36	21 25	21 14	21 01	20 53	20 45
21	.. ..	23 58	23 43	23 31	23 21	23 12	22 56	22 43	22 30	22 17	22 04	21 49	21 40	21 30
22	0 16	.. ..	.. ..	.. ..	.. ..	.. ..	23 51	23 37	23 23	23 10	22 55	22 39	22 29	22 18
23	1 19	0 58	0 42	0 29	0 18	0 08	.. ..	.. ..	.. ..	.. ..	23 47	23 30	23 20	23 09
24	2 12	1 51	1 35	1 22	1 10	1 01	0 44	0 29	0 15	0 01	.. ..	.. ..	.. ..	.. ..
25	2 56	2 36	2 21	2 09	1 58	1 49	1 33	1 18	1 05	0 52	0 38	0 22	0 13	0 02
26	3 32	3 15	3 02	2 51	2 41	2 33	2 18	2 05	1 54	1 42	1 29	1 14	1 06	0 56
27	4 03	3 49	3 37	3 28	3 20	3 13	3 01	2 50	2 40	2 30	2 19	2 07	2 00	1 51
28	4 29	4 18	4 09	4 02	3 56	3 50	3 41	3 33	3 25	3 17	3 08	2 59	2 53	2 47
29	4 52	4 44	4 39	4 34	4 30	4 26	4 19	4 14	4 08	4 03	3 57	3 51	3 47	3 42
30	5 13	5 09	5 06	5 04	5 02	5 00	4 56	4 54	4 51	4 48	4 45	4 42	4 40	4 38
Oct. 1	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 34
2	5 53	5 57	6 00	6 03	6 05	6 07	6 10	6 13	6 16	6 19	6 22	6 25	6 27	6 29

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Sept. 8	.. ..	.. ..	0 04	23 53	23 43	23 35	23 20	23 08	22 56	22 44	22 32	22 17	22 09	21 59
9	0 35	0 18	0 04	.. ..	.. ..	.. ..	.. ..	.. ..	23 47	23 33	23 19	23 03	22 54	22 43
10	1 38	1 18	1 03	0 50	0 39	0 30	0 14	0 00	.. ..	.. ..	.. ..	23 54	23 44	23 33
11	2 36	2 15	1 59	1 46	1 35	1 25	1 08	0 54	0 40	0 26	0 11	.. ..	.. ..	.. ..
12	3 28	3 08	2 53	2 40	2 29	2 20	2 03	1 49	1 35	1 22	1 07	0 50	0 41	0 30
13	4 13	3 56	3 42	3 31	3 21	3 12	2 57	2 44	2 32	2 20	2 06	1 51	1 42	1 32
14	4 52	4 38	4 27	4 18	4 10	4 03	3 50	3 40	3 30	3 19	3 08	2 56	2 48	2 40
15	5 25	5 16	5 08	5 01	4 56	4 51	4 42	4 34	4 27	4 20	4 12	4 03	3 58	3 52
16	5 55	5 50	5 46	5 43	5 40	5 37	5 32	5 28	5 24	5 20	5 16	5 11	5 08	5 05
17	6 23	6 23	6 22	6 22	6 22	6 22	6 21	6 21	6 21	6 20	6 20	6 19	6 19	6 19
18	6 50	6 54	6 58	7 01	7 04	7 06	7 10	7 13	7 16	7 20	7 23	7 27	7 29	7 32
19	7 19	7 27	7 35	7 41	7 46	7 50	7 58	8 05	8 12	8 19	8 26	8 34	8 38	8 43
20	7 50	8 03	8 13	8 22	8 29	8 36	8 48	8 58	9 07	9 17	9 27	9 38	9 45	9 53
21	8 25	8 41	8 55	9 06	9 15	9 23	9 38	9 50	10 02	10 13	10 26	10 40	10 49	10 58
22	9 05	9 24	9 40	9 52	10 03	10 12	10 28	10 42	10 56	11 09	11 23	11 39	11 48	11 59
23	9 52	10 12	10 29	10 42	10 53	11 03	11 20	11 35	11 48	12 02	12 17	12 34	12 43	12 55
24	10 44	11 05	11 21	11 34	11 45	11 55	12 11	12 26	12 40	12 53	13 08	13 24	13 34	13 45
25	11 42	12 01	12 16	12 28	12 38	12 47	13 03	13 16	13 29	13 41	13 55	14 10	14 19	14 29
26	12 43	12 59	13 12	13 23	13 32	13 40	13 53	14 05	14 16	14 27	14 39	14 52	15 00	15 09
27	13 46	13 59	14 10	14 18	14 25	14 32	14 43	14 53	15 02	15 11	15 20	15 31	15 37	15 45
28	14 50	15 00	15 07	15 14	15 19	15 24	15 32	15 39	15 46	15 52	16 00	16 07	16 12	16 17
29	15 55	16 01	16 05	16 09	16 13	16 15	16 20	16 25	16 29	16 33	16 37	16 42	16 45	16 48
30	17 00	17 02	17 03	17 05	17 06	17 07	17 08	17 10	17 11	17 13	17 14	17 16	17 16	17 17
Oct. 1	18 05	18 03	18 02	18 00	17 59	17 57	17 57	17 55	17 54	17 52	17 51	17 49	17 48	17 47
2	19 11	19 05	19 00	18 57	18 53	18 50	18 45	18 41	18 37	18 32	18 28	18 23	18 20	18 17

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
Sept. 8	h m 11 25	h m 11 29	h m 11 34	h m 11 38	h m 11 43	h m 11 49	h m 11 55	h m 12 01	h m 12 08	h m 12 17	h m 12 26	h m 12 37	h m 12 50	h m 13 05
9	12 23	12 28	12 33	12 38	12 44	12 50	12 57	13 05	13 13	13 23	13 34	13 47	14 03	14 22
10	13 20	13 25	13 30	13 36	13 42	13 49	13 57	14 05	14 14	14 25	14 37	14 52	15 09	15 31
11	14 15	14 20	14 25	14 31	14 38	14 44	14 52	15 00	15 10	15 21	15 33	15 48	16 05	16 27
12	15 07	15 12	15 17	15 23	15 29	15 35	15 42	15 50	15 58	16 08	16 20	16 33	16 48	17 07
13	15 56	16 00	16 05	16 09	16 14	16 20	16 26	16 32	16 40	16 48	16 57	17 08	17 20	17 35
14	16 42	16 45	16 48	16 52	16 56	17 00	17 04	17 09	17 15	17 21	17 28	17 35	17 44	17 55
15	17 24	17 26	17 28	17 31	17 33	17 36	17 38	17 41	17 45	17 49	17 53	17 58	18 03	18 10
16	18 04	18 05	18 06	18 07	18 08	18 09	18 10	18 11	18 12	18 14	18 15	18 17	18 19	18 22
17	18 43	18 43	18 42	18 42	18 41	18 41	18 40	18 39	18 39	18 38	18 37	18 36	18 34	18 33
18	19 22	19 21	19 19	19 17	19 15	19 13	19 11	19 08	19 05	19 02	18 58	18 54	18 50	18 45
19	20 03	20 00	19 57	19 54	19 50	19 47	19 43	19 38	19 34	19 28	19 22	19 15	19 07	18 58
20	20 45	20 41	20 37	20 33	20 29	20 24	20 18	20 12	20 05	19 58	19 50	19 40	19 29	19 15
21	21 30	21 26	21 21	21 16	21 10	21 04	20 58	20 50	20 42	20 33	20 23	20 11	19 56	19 39
22	22 18	22 13	22 08	22 02	21 56	21 50	21 42	21 34	21 25	21 15	21 03	20 49	20 33	20 12
23	23 09	23 04	22 59	22 53	22 47	22 40	22 32	22 24	22 15	22 04	21 52	21 37	21 20	20 59
24	.. ..	23 57	23 52	23 46	23 40	23 34	23 27	23 19	23 10	23 00	22 48	22 34	22 18	21 58
25	0 02	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 50	23 39	23 24	23 07
26	0 56	0 52	0 47	0 42	0 37	0 31	0 25	0 18	0 10	0 01	.. ..	.. ..	.. ..	.. ..
27	1 51	1 48	1 44	1 40	1 35	1 30	1 25	1 19	1 13	1 05	0 57	0 47	0 36	0 22
28	2 47	2 44	2 41	2 38	2 34	2 31	2 27	2 22	2 17	2 11	2 05	1 58	1 49	1 39
29	3 42	3 41	3 39	3 36	3 34	3 31	3 29	3 26	3 22	3 19	3 14	3 10	3 04	2 58
30	4 38	4 37	4 36	4 35	4 34	4 32	4 31	4 30	4 28	4 26	4 24	4 22	4 19	4 16
Oct. 1	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34
2	6 29	6 30	6 32	6 33	6 34	6 35	6 37	6 38	6 40	6 42	6 45	6 47	6 50	6 53

MOONSET

Sept. 8	h m 21 59	h m 21 55	h m 21 51	h m 21 46	h m 21 40	h m 21 35	h m 21 29	h m 21 22	h m 21 14	h m 21 05	h m 20 55	h m 20 44	h m 20 31	h m 20 15
9	22 43	22 38	22 33	22 28	22 22	22 15	22 08	22 00	21 51	21 41	21 30	21 17	21 01	20 41
10	23 33	23 28	23 23	23 17	23 10	23 04	22 56	22 48	22 38	22 27	22 15	22 00	21 43	21 21
11	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 53	23 45	23 35	23 25	23 12	22 58	22 41	22 19
12	0 30	0 25	0 19	0 13	0 07	0 00	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 55	23 36
13	1 32	1 28	1 23	1 18	1 12	1 06	0 59	0 52	0 43	0 34	0 23	0 10	.. ..	.. ..
14	2 40	2 36	2 32	2 28	2 23	2 18	2 13	2 07	2 00	1 52	1 44	1 33	1 22	1 07
15	3 52	3 49	3 46	3 43	3 40	3 36	3 32	3 28	3 23	3 18	3 12	3 05	2 57	2 47
16	5 05	5 03	5 02	5 00	4 58	4 56	4 54	4 52	4 49	4 47	4 43	4 40	4 35	4 31
17	6 19	6 18	6 18	6 18	6 18	6 18	6 17	6 17	6 17	6 17	6 16	6 16	6 15	6 15
18	7 32	7 33	7 34	7 35	7 37	7 38	7 40	7 42	7 44	7 46	7 48	7 51	7 54	7 58
19	8 43	8 46	8 48	8 51	8 54	8 57	9 00	9 04	9 08	9 13	9 18	9 24	9 31	9 39
20	9 53	9 56	10 00	10 03	10 08	10 12	10 17	10 23	10 29	10 36	10 44	10 53	11 03	11 16
21	10 58	11 02	11 07	11 12	11 17	11 23	11 29	11 36	11 44	11 53	12 03	12 14	12 28	12 45
22	11 59	12 04	12 09	12 14	12 20	12 27	12 34	12 42	12 51	13 01	13 13	13 26	13 43	14 03
23	12 55	13 00	13 05	13 11	13 17	13 24	13 31	13 40	13 49	14 00	14 12	14 26	14 44	15 05
24	13 45	13 49	13 55	14 00	14 06	14 13	14 20	14 28	14 38	14 48	15 00	15 13	15 30	15 50
25	14 29	14 34	14 38	14 44	14 49	14 55	15 02	15 09	15 17	15 27	15 37	15 50	16 04	16 22
26	15 09	15 13	15 17	15 21	15 26	15 31	15 37	15 43	15 50	15 58	16 07	16 17	16 29	16 43
27	15 45	15 48	15 51	15 55	15 58	16 03	16 07	16 12	16 18	16 24	16 31	16 39	16 48	16 59
28	16 17	16 20	16 22	16 25	16 27	16 30	16 34	16 37	16 41	16 46	16 51	16 56	17 03	17 10
29	16 48	16 49	16 51	16 52	16 54	16 56	16 58	17 00	17 02	17 05	17 08	17 11	17 15	17 19
30	17 17	17 18	17 19	17 19	17 19	17 20	17 21	17 21	17 22	17 23	17 24	17 25	17 26	17 27
Oct. 1	17 47	17 46	17 46	17 45	17 45	17 44	17 43	17 42	17 41	17 40	17 39	17 38	17 37	17 35
2	18 17	18 15	18 14	18 12	18 10	18 08	18 06	18 04	18 01	17 59	17 55	17 52	17 48	17 43

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 33	5 34
2	5 53	5 57	6 00	6 03	6 05	6 07	6 10	6 13	6 16	6 19	6 22	6 25	6 27	6 29
3	6 15	6 22	6 28	6 33	6 37	6 41	6 48	6 54	6 59	7 05	7 11	7 17	7 21	7 26
4	6 39	6 50	6 58	7 06	7 12	7 17	7 27	7 36	7 44	7 52	8 00	8 10	8 16	8 23
5	7 06	7 20	7 32	7 41	7 49	7 56	8 09	8 20	8 30	8 40	8 52	9 04	9 12	9 20
6	7 38	7 55	8 09	8 20	8 30	8 39	8 53	9 06	9 18	9 31	9 44	9 59	10 07	10 17
7	8 17	8 37	8 52	9 05	9 15	9 25	9 41	9 55	10 09	10 22	10 37	10 53	11 03	11 14
8	9 05	9 25	9 41	9 55	10 06	10 16	10 33	10 47	11 01	11 15	11 30	11 47	11 57	12 08
9	10 02	10 22	10 37	10 50	11 01	11 11	11 27	11 42	11 55	12 09	12 23	12 39	12 49	13 00
10	11 08	11 25	11 40	11 51	12 01	12 10	12 25	12 38	12 50	13 02	13 15	13 30	13 39	13 49
11	12 21	12 36	12 47	12 57	13 05	13 12	13 25	13 35	13 45	13 56	14 06	14 19	14 26	14 34
12	13 41	13 51	13 59	14 06	14 12	14 17	14 26	14 34	14 41	14 48	14 56	15 05	15 10	15 16
13	15 04	15 09	15 14	15 17	15 20	15 23	15 28	15 32	15 36	15 40	15 45	15 50	15 52	15 56
14	16 28	16 29	16 29	16 30	16 30	16 30	16 31	16 31	16 32	16 32	16 33	16 34	16 34	16 34
15	17 54	17 49	17 46	17 43	17 40	17 38	17 34	17 31	17 28	17 24	17 21	17 17	17 15	17 13
16	19 18	19 09	19 01	18 55	18 50	18 45	18 37	18 30	18 23	18 17	18 10	18 02	17 58	17 53
17	20 40	20 26	20 15	20 06	19 58	19 51	19 40	19 29	19 20	19 10	19 00	18 49	18 42	18 35
18	21 56	21 39	21 25	21 13	21 04	20 55	20 41	20 28	20 16	20 04	19 52	19 37	19 29	19 20
19	23 05	22 45	22 29	22 16	22 05	21 56	21 39	21 25	21 12	20 58	20 44	20 28	20 19	20 08
20	.. ..	23 43	23 27	23 13	23 02	22 52	22 35	22 20	22 06	21 52	21 37	21 20	21 11	20 59
21	0 04	.. ..	.. ..	.. ..	23 53	23 43	23 27	23 12	22 58	22 45	22 30	22 14	22 04	21 53
22	0 53	0 33	0 17	0 04	.. ..	.. ..	.. ..	.. ..	23 49	23 36	23 23	23 07	22 58	22 48
23	1 33	1 15	1 01	0 49	0 39	0 30	0 14	0 01	.. ..	.. ..	.. ..	.. ..	23 53	23 44
24	2 06	1 51	1 38	1 28	1 20	1 12	0 59	0 47	0 36	0 25	0 14	0 00	.. ..	.. ..
25	2 33	2 21	2 12	2 04	1 57	1 51	1 40	1 31	1 22	1 13	1 04	0 53	0 47	0 40

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 1	18 05	18 03	18 02	18 00	17 59	17 58	17 57	17 55	17 54	17 52	17 51	17 49	17 48	17 47
2	19 11	19 05	19 00	18 57	18 53	18 50	18 45	18 41	18 37	18 32	18 28	18 23	18 20	18 17
3	20 17	20 07	20 00	19 53	19 48	19 43	19 35	19 27	19 20	19 14	19 06	18 58	18 53	18 48
4	21 23	21 09	20 59	20 50	20 43	20 36	20 25	20 15	20 06	19 57	19 47	19 36	19 29	19 22
5	22 28	22 11	21 58	21 47	21 38	21 30	21 16	21 04	20 53	20 42	20 30	20 16	20 08	19 59
6	23 30	23 11	22 57	22 44	22 34	22 25	22 09	21 55	21 42	21 29	21 16	21 00	20 51	20 41
7	.. ..	.. ..	23 53	23 40	23 29	23 19	23 02	22 47	22 34	22 20	22 05	21 48	21 39	21 27
8	0 29	0 09	.. ..	.. ..	.. ..	.. ..	23 55	23 41	23 27	23 13	22 58	22 41	22 31	22 20
9	1 22	1 02	0 46	0 33	0 22	0 12	.. ..	.. ..	.. ..	.. ..	23 54	23 38	23 29	23 18
10	2 08	1 50	1 35	1 23	1 13	1 04	0 48	0 34	0 21	0 08	.. ..	.. ..	.. ..	.. ..
11	2 48	2 33	2 20	2 10	2 01	1 53	1 40	1 28	1 16	1 05	0 53	0 39	0 31	0 22
12	3 22	3 11	3 01	2 53	2 46	2 40	2 30	2 21	2 12	2 03	1 54	1 43	1 36	1 29
13	3 53	3 45	3 39	3 34	3 30	3 26	3 19	3 13	3 07	3 02	2 55	2 48	2 44	2 39
14	4 20	4 17	4 15	4 13	4 11	4 10	4 07	4 05	4 03	4 00	3 58	3 55	3 53	3 51
15	4 47	4 49	4 50	4 52	4 53	4 54	4 55	4 57	4 58	5 00	5 01	5 02	5 03	5 04
16	5 15	5 21	5 26	5 31	5 35	5 38	5 44	5 49	5 54	5 59	6 04	6 10	6 13	6 17
17	5 44	5 55	6 04	6 12	6 18	6 24	6 34	6 42	6 50	6 58	7 07	7 17	7 23	7 29
18	6 18	6 33	6 45	6 55	7 04	7 11	7 24	7 36	7 47	7 57	8 09	8 22	8 30	8 38
19	6 57	7 15	7 30	7 42	7 52	8 01	8 17	8 30	8 43	8 55	9 09	9 25	9 34	9 44
20	7 42	8 03	8 19	8 32	8 43	8 53	9 10	9 24	9 38	9 52	10 06	10 23	10 33	10 44
21	8 34	8 55	9 11	9 24	9 36	9 46	10 03	10 18	10 31	10 45	11 00	11 17	11 27	11 38
22	9 31	9 51	10 06	10 19	10 30	10 39	10 56	11 10	11 23	11 36	11 50	12 06	12 15	12 26
23	10 32	10 50	11 04	11 15	11 24	11 33	11 47	12 00	12 12	12 24	12 36	12 50	12 59	13 08
24	11 36	11 50	12 01	12 11	12 19	12 26	12 38	12 49	12 59	13 08	13 19	13 31	13 38	13 45
25	12 40	12 51	13 00	13 07	13 13	13 18	13 28	13 36	13 43	13 51	13 59	14 08	14 13	14 19

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

57

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
Oct. 1	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
2	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34	5 34
3	6 29	6 30	6 32	6 33	6 34	6 35	6 37	6 38	6 40	6 42	6 45	6 47	6 50	6 53
4	7 26	7 28	7 30	7 32	7 35	7 37	7 40	7 43	7 47	7 51	7 55	8 00	8 06	8 13
5	8 23	8 26	8 29	8 32	8 36	8 40	8 44	8 49	8 54	9 00	9 06	9 14	9 23	9 33
6	9 20	9 24	9 28	9 32	9 37	9 42	9 47	9 54	10 01	10 08	10 17	10 27	10 39	10 53
7	10 17	10 22	10 26	10 32	10 37	10 43	10 50	10 57	11 06	11 15	11 26	11 38	11 53	12 11
8	11 14	11 19	11 24	11 29	11 36	11 42	11 50	11 58	12 07	12 18	12 30	12 44	13 01	13 22
9	12 08	12 13	12 19	12 25	12 31	12 38	12 46	12 54	13 04	13 14	13 27	13 42	13 59	14 22
10	13 00	13 05	13 10	13 16	13 22	13 29	13 36	13 44	13 53	14 03	14 15	14 29	14 46	15 06
11	13 49	13 53	13 58	14 03	14 08	14 14	14 20	14 28	14 36	14 45	14 55	15 07	15 21	15 38
12	14 34	14 37	14 41	14 45	14 50	14 54	14 59	15 05	15 12	15 19	15 27	15 36	15 47	15 59
13	15 16	15 18	15 21	15 24	15 27	15 30	15 34	15 38	15 43	15 48	15 53	15 59	16 07	16 15
14	15 56	15 57	15 59	16 00	16 02	16 04	16 06	16 08	16 10	16 13	16 16	16 19	16 23	16 28
15	16 34	16 35	16 35	16 35	16 35	16 35	16 36	16 36	16 36	16 37	16 37	16 38	16 38	16 39
16	17 13	17 12	17 11	17 10	17 08	17 07	17 06	17 04	17 02	17 00	16 58	16 56	16 53	16 50
17	17 53	17 51	17 48	17 46	17 43	17 40	17 37	17 34	17 30	17 25	17 21	17 15	17 09	17 02
18	18 35	18 32	18 28	18 24	18 20	18 16	18 11	18 06	18 00	17 54	17 46	17 38	17 28	17 17
19	19 20	19 16	19 11	19 06	19 01	18 56	18 50	18 43	18 35	18 27	18 17	18 06	17 53	17 38
20	20 08	20 03	19 58	19 53	19 47	19 40	19 33	19 25	19 16	19 07	18 55	18 42	18 26	18 07
21	20 59	20 54	20 49	20 43	20 37	20 30	20 22	20 14	20 05	19 54	19 42	19 27	19 10	18 48
22	21 53	21 48	21 43	21 37	21 31	21 24	21 17	21 08	20 59	20 49	20 37	20 22	20 05	19 44
23	22 48	22 44	22 39	22 34	22 28	22 22	22 15	22 07	21 59	21 49	21 38	21 26	21 10	20 52
24	23 44	23 40	23 36	23 31	23 26	23 21	23 15	23 09	23 02	22 54	22 44	22 34	22 21	22 06
25	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 53	23 45	23 35	23 24
26	0 40	0 37	0 33	0 30	0 26	0 22	0 17	0 12	0 06	0 00	.. ..	.. ..	.. ..	.. ..

MOONSET

Oct.	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	17 47	17 46	17 46	17 45	17 45	17 44	17 43	17 42	17 41	17 40	17 39	17 38	17 37	17 35
2	18 17	18 15	18 14	18 12	18 10	18 08	18 06	18 04	18 01	17 59	17 55	17 52	17 48	17 43
3	18 48	18 46	18 43	18 40	18 37	18 34	18 31	18 27	18 23	18 18	18 13	18 07	18 01	17 53
4	19 22	19 18	19 15	19 11	19 07	19 03	18 58	18 53	18 47	18 41	18 34	18 25	18 16	18 04
5	19 59	19 55	19 51	19 46	19 41	19 36	19 30	19 23	19 16	19 08	18 58	18 48	18 35	18 20
6	20 41	20 36	20 31	20 26	20 20	20 14	20 07	19 59	19 51	19 41	19 30	19 17	19 02	18 43
7	21 27	21 22	21 17	21 11	21 05	20 58	20 51	20 42	20 33	20 22	20 10	19 56	19 39	19 17
8	22 20	22 15	22 10	22 04	21 57	21 51	21 43	21 34	21 25	21 14	21 02	20 47	20 29	20 07
9	23 18	23 14	23 09	23 03	22 57	22 51	22 43	22 35	22 27	22 16	22 05	21 51	21 35	21 15
10	.. ..	.. ..	.. ..	.. ..	.. ..	23 58	23 52	23 45	23 37	23 29	23 19	23 07	22 54	22 38
11	0 22	0 18	0 13	0 09	0 03	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
12	1 29	1 26	1 23	1 19	1 15	1 11	1 06	1 01	0 55	0 48	0 41	0 33	0 23	0 11
13	2 39	2 37	2 35	2 33	2 30	2 27	2 24	2 21	2 17	2 13	2 08	2 03	1 57	1 50
14	3 51	3 51	3 50	3 49	3 48	3 47	3 45	3 44	3 43	3 41	3 39	3 37	3 34	3 32
15	5 04	5 05	5 05	5 06	5 06	5 07	5 08	5 08	5 09	5 10	5 11	5 12	5 13	5 15
16	6 17	6 19	6 21	6 23	6 25	6 27	6 30	6 32	6 35	6 39	6 42	6 47	6 52	6 57
17	7 29	7 32	7 35	7 38	7 42	7 46	7 50	7 55	8 00	8 06	8 12	8 20	8 28	8 39
18	8 38	8 42	8 46	8 51	8 56	9 01	9 07	9 13	9 20	9 28	9 37	9 48	10 00	10 15
19	9 44	9 48	9 53	9 59	10 04	10 11	10 18	10 25	10 34	10 43	10 55	11 08	11 23	11 42
20	10 44	10 49	10 54	11 00	11 06	11 13	11 21	11 29	11 38	11 49	12 01	12 15	12 33	12 54
21	11 38	11 43	11 48	11 54	12 00	12 07	12 15	12 23	12 32	12 43	12 55	13 10	13 27	13 48
22	12 26	12 31	12 36	12 41	12 47	12 53	13 00	13 08	13 17	13 26	13 38	13 51	14 06	14 25
23	13 08	13 12	13 17	13 21	13 26	13 32	13 38	13 45	13 52	14 01	14 11	14 22	14 35	14 50
24	13 45	13 49	13 52	13 56	14 01	14 05	14 10	14 16	14 22	14 29	14 36	14 45	14 55	15 07
25	14 19	14 22	14 24	14 27	14 31	14 34	14 38	14 42	14 47	14 52	14 57	15 04	15 11	15 20

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 24	2 06	1 51	1 38	1 28	1 20	1 12	0 59	0 47	0 36	0 25	0 14	0 00	.. ..	.. ..
25	2 33	2 21	2 12	2 04	1 57	1 51	1 40	1 31	1 22	1 13	1 04	0 53	0 47	0 40
26	2 57	2 49	2 42	2 36	2 31	2 27	2 19	2 12	2 06	2 00	1 53	1 45	1 41	1 36
27	3 19	3 14	3 10	3 06	3 03	3 01	2 56	2 52	2 49	2 45	2 41	2 37	2 34	2 31
28	3 39	3 38	3 36	3 36	3 35	3 34	3 33	3 32	3 31	3 30	3 29	3 28	3 27	3 27
29	3 59	4 01	4 03	4 05	4 06	4 08	4 10	4 12	4 13	4 15	4 17	4 20	4 21	4 23
30	4 20	4 26	4 31	4 35	4 39	4 42	4 47	4 52	4 57	5 01	5 06	5 12	5 15	5 19
31	4 43	4 52	5 00	5 07	5 12	5 17	5 26	5 34	5 41	5 48	5 56	6 05	6 10	6 16
Nov. 1	5 09	5 22	5 33	5 41	5 49	5 56	6 07	6 18	6 27	6 37	6 48	6 59	7 06	7 14
2	5 39	5 56	6 09	6 20	6 29	6 37	6 51	7 04	7 16	7 27	7 40	7 54	8 03	8 12
3	6 16	6 35	6 50	7 03	7 13	7 23	7 39	7 53	8 06	8 19	8 33	8 49	8 59	9 10
4	7 01	7 22	7 38	7 51	8 02	8 12	8 29	8 44	8 58	9 12	9 27	9 44	9 54	10 05
5	7 55	8 15	8 31	8 44	8 56	9 06	9 22	9 37	9 51	10 05	10 20	10 37	10 47	10 58
6	8 57	9 16	9 31	9 43	9 54	10 03	10 18	10 32	10 45	10 58	11 12	11 27	11 36	11 47
7	10 07	10 23	10 35	10 46	10 55	11 03	11 16	11 28	11 39	11 50	12 02	12 15	12 23	12 32
8	11 22	11 34	11 44	11 52	11 58	12 04	12 15	12 24	12 33	12 41	12 50	13 01	13 07	13 13
9	12 41	12 48	12 54	13 00	13 04	13 08	13 15	13 20	13 26	13 31	13 37	13 44	13 48	13 52
10	14 02	14 05	14 07	14 09	14 11	14 12	14 15	14 17	14 19	14 21	14 24	14 26	14 28	14 30
11	15 24	15 22	15 21	15 19	15 18	15 17	15 16	15 14	15 13	15 11	15 10	15 09	15 08	15 07
12	16 47	16 41	16 35	16 30	16 26	16 23	16 17	16 12	16 07	16 02	15 57	15 51	15 48	15 45
13	18 10	17 58	17 49	17 41	17 35	17 29	17 19	17 10	17 02	16 54	16 46	16 36	16 31	16 24
14	19 30	19 14	19 01	18 51	18 42	18 34	18 21	18 09	17 59	17 48	17 36	17 23	17 16	17 07
15	20 44	20 25	20 10	19 57	19 47	19 37	19 22	19 08	18 55	18 42	18 29	18 13	18 04	17 54
16	21 49	21 28	21 12	20 59	20 47	20 37	20 20	20 05	19 51	19 38	19 23	19 06	18 56	18 45
17	22 45	22 24	22 07	21 54	21 43	21 33	21 15	21 00	20 46	20 32	20 17	20 00	19 50	19 39

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 24	11 36	11 50	12 01	12 11	12 19	12 26	12 38	12 49	12 59	13 08	13 19	13 31	13 38	13 45
25	12 40	12 51	13 00	13 07	13 13	13 18	13 28	13 36	13 43	13 51	13 59	14 08	14 13	14 19
26	13 45	13 52	13 58	14 02	14 06	14 10	14 16	14 22	14 27	14 32	14 37	14 43	14 46	14 50
27	14 50	14 53	14 56	14 58	15 00	15 01	15 04	15 07	15 09	15 11	15 14	15 17	15 18	15 20
28	15 55	15 54	15 54	15 54	15 53	15 53	15 52	15 52	15 51	15 51	15 51	15 50	15 50	15 49
29	17 01	16 56	16 53	16 50	16 47	16 45	16 41	16 37	16 34	16 31	16 27	16 24	16 21	16 19
30	18 07	17 59	17 52	17 47	17 42	17 38	17 30	17 24	17 18	17 12	17 06	16 58	16 54	16 50
31	19 14	19 02	18 52	18 44	18 37	18 31	18 21	18 12	18 03	17 55	17 46	17 35	17 29	17 23
Nov. 1	20 20	20 05	19 52	19 42	19 33	19 26	19 13	19 01	18 50	18 40	18 28	18 15	18 07	17 59
2	21 25	21 06	20 52	20 40	20 30	20 21	20 05	19 52	19 40	19 27	19 14	18 58	18 49	18 39
3	22 26	22 05	21 49	21 36	21 25	21 16	20 59	20 44	20 31	20 17	20 02	19 46	19 36	19 25
4	23 21	23 00	22 44	22 31	22 19	22 09	21 52	21 37	21 23	21 09	20 54	20 37	20 27	20 16
5	.. ..	23 49	23 34	23 21	23 10	23 01	22 45	22 30	22 17	22 03	21 49	21 32	21 23	21 12
6	0 09	.. ..	.. ..	.. ..	23 59	23 50	23 36	23 23	23 11	22 59	22 46	22 31	22 22	22 12
7	0 50	0 33	0 19	0 08	.. ..	.. ..	.. ..	.. ..	.. ..	23 55	23 44	23 32	23 25	23 17
8	1 24	1 11	1 00	0 51	0 44	0 37	0 25	0 14	0 05	.. ..	.. ..	.. ..	.. ..	.. ..
9	1 55	1 45	1 38	1 31	1 26	1 21	1 13	1 05	0 58	0 51	0 43	0 34	0 29	0 24
10	2 22	2 17	2 13	2 09	2 06	2 04	1 59	1 55	1 51	1 47	1 43	1 38	1 36	1 32
11	2 47	2 47	2 47	2 46	2 46	2 46	2 45	2 45	2 45	2 44	2 44	2 43	2 43	2 42
12	3 13	3 17	3 21	3 24	3 26	3 28	3 32	3 35	3 38	3 41	3 45	3 48	3 51	3 53
13	3 41	3 49	3 56	4 02	4 07	4 12	4 20	4 27	4 33	4 40	4 47	4 54	4 59	5 04
14	4 11	4 25	4 35	4 44	4 51	4 58	5 09	5 19	5 29	5 38	5 49	6 00	6 07	6 15
15	4 47	5 04	5 17	5 29	5 38	5 47	6 01	6 14	6 26	6 37	6 50	7 05	7 13	7 23
16	5 29	5 49	6 05	6 17	6 28	6 38	6 54	7 09	7 22	7 36	7 50	8 06	8 16	8 27
17	6 19	6 40	6 56	7 10	7 21	7 31	7 49	8 04	8 18	8 32	8 47	9 04	9 14	9 26

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 24	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 53	23 45	23 35	23 24
25	0 40	0 37	0 33	0 30	0 26	0 22	0 17	0 12	0 06	0 00	.. ..	.. ..	.. ..	.. ..
26	1 36	1 33	1 31	1 28	1 26	1 23	1 19	1 16	1 12	1 07	1 02	0 57	0 50	0 42
27	2 31	2 30	2 28	2 27	2 25	2 24	2 22	2 20	2 17	2 15	2 12	2 09	2 05	2 01
28	3 27	3 26	3 26	3 26	3 25	3 25	3 24	3 24	3 23	3 23	3 22	3 21	3 20	3 19
29	4 23	4 23	4 24	4 25	4 26	4 26	4 27	4 28	4 30	4 31	4 32	4 34	4 36	4 38
30	5 19	5 21	5 23	5 24	5 26	5 29	5 31	5 34	5 37	5 40	5 44	5 48	5 53	5 58
31	6 16	6 19	6 22	6 25	6 28	6 32	6 35	6 40	6 44	6 50	6 56	7 02	7 10	7 20
Nov. 1	7 14	7 18	7 22	7 26	7 30	7 35	7 40	7 46	7 52	7 59	8 08	8 17	8 28	8 41
2	8 12	8 17	8 21	8 26	8 32	8 37	8 44	8 51	8 59	9 08	9 18	9 30	9 44	10 01
3	9 10	9 15	9 20	9 25	9 31	9 38	9 45	9 53	10 03	10 13	10 25	10 39	10 55	11 16
4	10 05	10 10	10 16	10 22	10 28	10 35	10 43	10 51	11 01	11 12	11 25	11 40	11 58	12 20
5	10 58	11 03	11 08	11 14	11 20	11 27	11 35	11 43	11 53	12 03	12 16	12 30	12 48	13 09
6	11 47	11 51	11 56	12 02	12 07	12 14	12 21	12 28	12 37	12 46	12 57	13 10	13 25	13 44
7	12 32	12 36	12 40	12 44	12 49	12 54	13 00	13 07	13 14	13 22	13 31	13 41	13 53	14 07
8	13 13	13 16	13 19	13 23	13 27	13 31	13 35	13 40	13 45	13 51	13 57	14 05	14 14	14 24
9	13 52	13 54	13 56	13 58	14 01	14 03	14 06	14 09	14 12	14 16	14 20	14 25	14 30	14 36
10	14 30	14 30	14 31	14 32	14 33	14 34	14 35	14 36	14 38	14 39	14 41	14 43	14 45	14 47
11	15 07	15 06	15 06	15 05	15 05	15 04	15 04	15 03	15 02	15 01	15 01	15 00	14 58	14 57
12	15 45	15 43	15 41	15 39	15 37	15 35	15 33	15 30	15 28	15 25	15 21	15 17	15 13	15 08
13	16 24	16 22	16 19	16 16	16 12	16 09	16 05	16 00	15 56	15 50	15 44	15 37	15 30	15 21
14	17 07	17 04	17 00	16 55	16 51	16 46	16 40	16 34	16 28	16 20	16 12	16 02	15 51	15 37
15	17 54	17 50	17 45	17 40	17 34	17 28	17 21	17 14	17 06	16 56	16 46	16 33	16 19	16 01
16	18 45	18 40	18 35	18 29	18 23	18 16	18 08	18 00	17 51	17 40	17 28	17 14	16 57	16 36
17	19 39	19 34	19 28	19 22	19 16	19 09	19 01	18 53	18 43	18 33	18 20	18 05	17 47	17 25

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 24	13 45	13 49	13 52	13 56	14 01	14 05	14 10	14 16	14 22	14 29	14 36	14 45	14 55	15 07
25	14 19	14 22	14 24	14 27	14 31	14 34	14 38	14 42	14 47	14 52	14 57	15 04	15 11	15 20
26	14 50	14 52	14 54	14 56	14 58	15 00	15 03	15 05	15 08	15 12	15 15	15 19	15 24	15 30
27	15 20	15 21	15 22	15 23	15 24	15 25	15 26	15 27	15 28	15 30	15 31	15 33	15 35	15 38
28	15 49	15 49	15 49	15 49	15 48	15 48	15 48	15 48	15 47	15 47	15 47	15 46	15 46	15 45
29	16 19	16 18	16 16	16 15	16 14	16 12	16 11	16 09	16 07	16 05	16 02	16 00	15 57	15 53
30	16 50	16 47	16 45	16 43	16 40	16 38	16 35	16 31	16 28	16 24	16 19	16 14	16 08	16 02
31	17 23	17 20	17 16	17 13	17 09	17 05	17 01	16 56	16 51	16 45	16 39	16 31	16 22	16 12
Nov. 1	17 59	17 55	17 51	17 47	17 42	17 37	17 31	17 25	17 18	17 10	17 02	16 52	16 40	16 26
2	18 39	18 35	18 30	18 25	18 19	18 13	18 06	17 59	17 51	17 42	17 31	17 19	17 04	16 46
3	19 25	19 20	19 14	19 09	19 03	18 56	18 48	18 40	18 31	18 20	18 08	17 54	17 37	17 16
4	20 16	20 10	20 05	19 59	19 53	19 46	19 38	19 29	19 20	19 09	18 56	18 41	18 23	18 00
5	21 12	21 07	21 01	20 56	20 50	20 43	20 35	20 27	20 18	20 07	19 55	19 41	19 23	19 02
6	22 12	22 08	22 03	21 58	21 53	21 47	21 40	21 33	21 24	21 15	21 04	20 52	20 37	20 19
7	23 17	23 13	23 09	23 05	23 01	22 56	22 50	22 44	22 38	22 31	22 22	22 12	22 01	21 47
8	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 56	23 51	23 45	23 38	23 31	23 22
9	0 24	0 21	0 18	0 15	0 12	0 09	0 05	0 01	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
10	1 32	1 31	1 29	1 28	1 26	1 24	1 22	1 20	1 17	1 14	1 11	1 08	1 04	0 59
11	2 42	2 42	2 42	2 42	2 41	2 41	2 41	2 41	2 40	2 40	2 40	2 39	2 39	2 38
12	3 53	3 54	3 55	3 57	3 58	3 59	4 01	4 03	4 04	4 06	4 09	4 11	4 15	4 18
13	5 04	5 06	5 09	5 11	5 14	5 17	5 21	5 24	5 28	5 33	5 38	5 44	5 51	5 59
14	6 15	6 18	6 22	6 25	6 30	6 34	6 39	6 45	6 51	6 58	7 06	7 15	7 25	7 38
15	7 23	7 27	7 32	7 37	7 42	7 48	7 54	8 01	8 09	8 18	8 28	8 40	8 54	9 12
16	8 27	8 32	8 37	8 43	8 49	8 55	9 03	9 11	9 20	9 30	9 42	9 56	10 13	10 34
17	9 26	9 31	9 36	9 42	9 48	9 55	10 03	10 12	10 21	10 32	10 45	10 59	11 17	11 39

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997
UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Nov. 16	21 49	21 28	21 12	20 59	20 47	20 37	20 20	20 05	19 51	19 38	19 23	19 06	18 56	18 45
17	22 45	22 24	22 07	21 54	21 43	21 33	21 15	21 00	20 46	20 32	20 17	20 00	19 50	19 39
18	23 30	23 11	22 55	22 43	22 32	22 23	22 06	21 52	21 39	21 26	21 11	20 55	20 46	20 35
19	.. ..	23 50	23 37	23 26	23 16	23 08	22 53	22 41	22 29	22 17	22 05	21 50	21 42	21 32
20	0 07	.. ..	.. ..	.. ..	23 55	23 49	23 37	23 26	23 16	23 07	22 56	22 44	22 37	22 29
21	0 37	0 23	0 12	0 03	.. ..	.. ..	.. ..	.. ..	.. ..	23 54	23 46	23 37	23 32	23 26
22	1 02	0 52	0 44	0 37	0 31	0 26	0 17	0 09	0 02	.. ..	.. ..	.. ..	.. ..	.. ..
23	1 24	1 18	1 13	1 08	1 04	1 01	0 55	0 50	0 45	0 40	0 35	0 29	0 26	0 22
24	1 45	1 42	1 40	1 38	1 36	1 35	1 32	1 30	1 27	1 25	1 23	1 21	1 19	1 17
25	2 05	2 05	2 06	2 07	2 07	2 08	2 08	2 09	2 10	2 10	2 11	2 12	2 12	2 13
26	2 25	2 29	2 33	2 36	2 39	2 41	2 45	2 49	2 52	2 56	3 00	3 04	3 06	3 09
27	2 47	2 55	3 01	3 07	3 12	3 16	3 24	3 30	3 36	3 43	3 49	3 57	4 01	4 06
28	3 11	3 23	3 32	3 40	3 47	3 53	4 04	4 13	4 22	4 31	4 40	4 51	4 57	5 05
29	3 40	3 55	4 07	4 17	4 26	4 34	4 47	4 59	5 10	5 21	5 33	5 46	5 54	6 03
30	4 14	4 32	4 47	4 59	5 09	5 18	5 34	5 47	6 00	6 13	6 27	6 43	6 52	7 02
Dec. 1	4 56	5 17	5 33	5 46	5 57	6 07	6 24	6 39	6 53	7 06	7 21	7 38	7 48	8 00
2	5 48	6 09	6 25	6 39	6 50	7 00	7 17	7 32	7 47	8 01	8 16	8 33	8 43	8 55
3	6 48	7 08	7 24	7 37	7 48	7 57	8 13	8 28	8 41	8 55	9 09	9 25	9 35	9 46
4	7 56	8 14	8 27	8 39	8 48	8 57	9 11	9 24	9 36	9 48	10 00	10 15	10 23	10 33
5	9 10	9 24	9 35	9 44	9 51	9 58	10 10	10 20	10 30	10 39	10 49	11 01	11 08	11 15
6	10 27	10 37	10 44	10 50	10 56	11 00	11 09	11 16	11 22	11 29	11 36	11 44	11 49	11 54
7	11 46	11 51	11 55	11 58	12 01	12 03	12 07	12 11	12 14	12 18	12 22	12 26	12 28	12 31
8	13 06	13 06	13 06	13 06	13 06	13 06	13 06	13 06	13 06	13 06	13 06	13 06	13 07	13 07
9	14 26	14 21	14 18	14 14	14 12	14 09	14 05	14 02	13 58	13 55	13 51	13 47	13 45	13 43
10	15 46	15 37	15 29	15 23	15 18	15 13	15 05	14 58	14 51	14 44	14 37	14 30	14 25	14 20

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Nov. 16	5 29	5 49	6 05	6 17	6 28	6 38	6 54	7 09	7 22	7 36	7 50	8 06	8 16	8 27
17	6 19	6 40	6 56	7 10	7 21	7 31	7 49	8 04	8 18	8 32	8 47	9 04	9 14	9 26
18	7 15	7 36	7 52	8 05	8 17	8 26	8 43	8 58	9 12	9 26	9 40	9 57	10 07	10 18
19	8 16	8 35	8 50	9 02	9 12	9 22	9 37	9 51	10 03	10 16	10 29	10 45	10 54	11 04
20	9 20	9 36	9 49	9 59	10 08	10 16	10 30	10 41	10 52	11 03	11 15	11 28	11 35	11 44
21	10 26	10 38	10 48	10 56	11 03	11 10	11 20	11 30	11 38	11 47	11 56	12 07	12 13	12 20
22	11 31	11 40	11 47	11 53	11 58	12 02	12 10	12 16	12 23	12 29	12 35	12 43	12 47	12 52
23	12 36	12 41	12 45	12 49	12 51	12 54	12 58	13 02	13 06	13 09	13 13	13 17	13 19	13 22
24	13 41	13 43	13 43	13 44	13 45	13 45	13 46	13 47	13 48	13 49	13 49	13 50	13 51	13 51
25	14 47	14 44	14 42	14 40	14 38	14 37	14 34	14 32	14 30	14 28	14 26	14 23	14 22	14 20
26	15 53	15 47	15 41	15 37	15 33	15 29	15 23	15 18	15 13	15 09	15 03	14 57	14 54	14 50
27	17 00	16 50	16 41	16 34	16 28	16 23	16 14	16 06	15 58	15 50	15 42	15 33	15 28	15 22
28	18 08	17 53	17 42	17 33	17 25	17 18	17 05	16 55	16 45	16 35	16 24	16 12	16 05	15 57
29	19 14	18 57	18 43	18 32	18 22	18 13	17 59	17 46	17 34	17 22	17 09	16 54	16 46	16 36
30	20 18	19 58	19 43	19 30	19 19	19 09	18 53	18 39	18 25	18 12	17 57	17 41	17 31	17 20
Dec. 1	21 17	20 56	20 40	20 26	20 15	20 05	19 47	19 32	19 18	19 04	18 49	18 32	18 22	18 10
2	22 09	21 48	21 32	21 19	21 08	20 58	20 41	20 27	20 13	19 59	19 44	19 27	19 17	19 05
3	22 52	22 34	22 20	22 08	21 58	21 49	21 34	21 20	21 07	20 55	20 41	20 25	20 16	20 06
4	23 29	23 14	23 03	22 53	22 44	22 37	22 24	22 12	22 02	21 51	21 39	21 26	21 18	21 09
5	.. ..	23 50	23 41	23 33	23 27	23 21	23 12	23 03	22 55	22 47	22 38	22 28	22 22	22 15
6	0 00	.. ..	.. ..	.. ..	.. ..	.. ..	23 58	23 52	23 47	23 42	23 37	23 30	23 27	23 22
7	0 28	0 21	0 16	0 11	0 07	0 04	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
8	0 53	0 51	0 49	0 47	0 46	0 45	0 43	0 41	0 39	0 37	0 35	0 33	0 32	0 30
9	1 17	1 20	1 21	1 23	1 24	1 25	1 27	1 29	1 31	1 32	1 34	1 36	1 37	1 38
10	1 43	1 49	1 55	1 59	2 03	2 07	2 13	2 18	2 23	2 28	2 34	2 40	2 43	2 47

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Nov. 16	18 45	18 40	18 35	18 29	18 23	18 16	18 08	18 00	17 51	17 40	17 28	17 14	16 57	16 36
17	19 39	19 34	19 28	19 22	19 16	19 09	19 01	18 53	18 43	18 33	18 20	18 05	17 47	17 25
18	20 35	20 30	20 25	20 19	20 13	20 07	20 00	19 51	19 42	19 32	19 20	19 07	18 50	18 30
19	21 32	21 28	21 23	21 18	21 13	21 07	21 01	20 54	20 46	20 37	20 27	20 15	20 01	19 44
20	22 29	22 26	22 22	22 18	22 13	22 09	22 03	21 58	21 51	21 44	21 36	21 26	21 15	21 02
21	23 26	23 23	23 20	23 17	23 14	23 10	23 06	23 02	22 57	22 52	22 46	22 39	22 31	22 22
22	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 56	23 52	23 47	23 41
23	0 22	0 20	0 18	0 16	0 14	0 12	0 09	0 07	0 04	0 00	.. ..	.. ..	.. ..	.. ..
24	1 17	1 17	1 16	1 15	1 14	1 13	1 12	1 11	1 10	1 08	1 06	1 05	1 03	1 00
25	2 13	2 13	2 14	2 14	2 14	2 15	2 15	2 15	2 16	2 16	2 17	2 17	2 18	2 19
26	3 09	3 11	3 12	3 13	3 15	3 17	3 18	3 20	3 23	3 25	3 28	3 31	3 35	3 39
27	4 06	4 09	4 11	4 14	4 16	4 19	4 23	4 26	4 30	4 35	4 40	4 45	4 52	5 00
28	5 05	5 08	5 11	5 15	5 19	5 23	5 28	5 33	5 39	5 45	5 52	6 01	6 11	6 22
29	6 03	6 07	6 12	6 16	6 21	6 27	6 33	6 40	6 47	6 55	7 05	7 16	7 29	7 45
30	7 02	7 07	7 12	7 17	7 23	7 30	7 37	7 45	7 53	8 03	8 15	8 28	8 44	9 04
Dec. 1	8 00	8 05	8 10	8 16	8 23	8 30	8 37	8 46	8 56	9 07	9 19	9 34	9 52	10 15
2	8 55	9 00	9 05	9 11	9 18	9 25	9 33	9 41	9 51	10 02	10 15	10 30	10 48	11 11
3	9 46	9 51	9 56	10 01	10 08	10 14	10 21	10 29	10 38	10 49	11 00	11 14	11 30	11 51
4	10 33	10 37	10 41	10 46	10 51	10 57	11 03	11 10	11 18	11 27	11 36	11 48	12 01	12 17
5	11 15	11 18	11 22	11 26	11 30	11 34	11 39	11 45	11 51	11 57	12 05	12 13	12 23	12 35
6	11 54	11 57	11 59	12 02	12 05	12 08	12 11	12 15	12 19	12 23	12 28	12 34	12 41	12 48
7	12 31	12 32	12 34	12 35	12 36	12 38	12 40	12 42	12 44	12 46	12 49	12 52	12 55	12 59
8	13 07	13 07	13 07	13 07	13 07	13 07	13 07	13 07	13 07	13 07	13 08	13 08	13 08	13 08
9	13 43	13 42	13 40	13 39	13 38	13 36	13 35	13 33	13 31	13 29	13 27	13 24	13 21	13 18
10	14 20	14 18	14 15	14 13	14 10	14 07	14 04	14 00	13 56	13 52	13 47	13 42	13 36	13 28

MOONSET

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Nov. 16	8 27	8 32	8 37	8 43	8 49	8 55	9 03	9 11	9 20	9 30	9 42	9 56	10 13	10 34
17	9 26	9 31	9 36	9 42	9 48	9 55	10 03	10 12	10 21	10 32	10 45	10 59	11 17	11 39
18	10 18	10 23	10 28	10 34	10 40	10 47	10 54	11 02	11 11	11 22	11 34	11 48	12 05	12 25
19	11 04	11 08	11 13	11 18	11 24	11 30	11 36	11 44	11 52	12 01	12 12	12 24	12 38	12 56
20	11 44	11 48	11 52	11 56	12 01	12 06	12 11	12 18	12 24	12 32	12 41	12 51	13 02	13 16
21	12 20	12 23	12 26	12 29	12 33	12 37	12 41	12 46	12 51	12 57	13 04	13 11	13 20	13 30
22	12 52	12 54	12 56	12 59	13 01	13 04	13 07	13 10	13 14	13 18	13 23	13 28	13 34	13 41
23	13 22	13 23	13 25	13 26	13 27	13 29	13 31	13 32	13 35	13 37	13 39	13 42	13 45	13 49
24	13 51	13 51	13 52	13 52	13 52	13 53	13 53	13 53	13 54	13 54	13 55	13 55	13 56	13 57
25	14 20	14 20	14 19	14 18	14 17	14 16	14 15	14 14	14 13	14 11	14 10	14 08	14 06	14 04
26	14 50	14 49	14 47	14 45	14 43	14 41	14 38	14 35	14 33	14 29	14 26	14 22	14 17	14 12
27	15 22	15 20	15 17	15 14	15 11	15 07	15 03	14 59	14 54	14 49	14 44	14 37	14 30	14 21
28	15 57	15 54	15 50	15 46	15 42	15 37	15 32	15 26	15 20	15 13	15 05	14 56	14 45	14 33
29	16 36	16 32	16 27	16 22	16 17	16 11	16 05	15 58	15 50	15 41	15 31	15 20	15 06	14 50
30	17 20	17 15	17 10	17 05	16 59	16 52	16 45	16 37	16 28	16 17	16 06	15 52	15 35	15 15
Dec. 1	18 10	18 05	17 59	17 53	17 47	17 40	17 32	17 23	17 14	17 03	16 50	16 35	16 17	15 54
2	19 05	19 00	18 55	18 49	18 43	18 36	18 28	18 19	18 10	17 59	17 46	17 31	17 13	16 50
3	20 06	20 01	19 56	19 51	19 45	19 38	19 31	19 23	19 15	19 05	18 53	18 40	18 24	18 04
4	21 09	21 05	21 01	20 57	20 52	20 46	20 41	20 34	20 27	20 19	20 09	19 58	19 46	19 30
5	22 15	22 12	22 09	22 06	22 02	21 58	21 54	21 49	21 43	21 37	21 31	21 23	21 14	21 03
6	23 22	23 21	23 19	23 16	23 14	23 12	23 09	23 06	23 03	22 59	22 55	22 50	22 45	22 38
7	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
8	0 30	0 30	0 29	0 28	0 27	0 26	0 25	0 24	0 23	0 22	0 20	0 19	0 17	0 14
9	1 38	1 39	1 40	1 40	1 41	1 42	1 42	1 43	1 44	1 45	1 47	1 48	1 49	1 51
10	2 47	2 49	2 51	2 53	2 55	2 57	3 00	3 03	3 06	3 09	3 13	3 17	3 23	3 29

.. .. indicates phenomenon will occur the next day.

MOONRISE AND MOONSET, 1997

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH

MOONRISE

Lat.	-55°	-50°	-45°	-40°	-35°	-30°	-20°	-10°	0°	+10°	+20°	+30°	+35°	+40°
Dec. 9	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
10	14 26	14 21	14 18	14 14	14 12	14 09	14 05	14 02	13 58	13 55	13 51	13 47	13 45	13 43
11	15 46	15 37	15 29	15 23	15 18	15 13	15 05	14 58	14 51	14 44	14 37	14 30	14 25	14 20
12	17 06	16 52	16 41	16 31	16 24	16 17	16 05	15 55	15 45	15 36	15 25	15 14	15 07	15 00
13	18 21	18 04	17 50	17 38	17 28	17 20	17 05	16 52	16 40	16 28	16 16	16 01	15 53	15 44
14	19 31	19 11	18 55	18 42	18 30	18 21	18 04	17 50	17 36	17 23	17 08	16 52	16 42	16 32
15	20 32	20 11	19 54	19 40	19 29	19 19	19 01	18 46	18 32	18 18	18 03	17 45	17 35	17 24
16	21 23	21 02	20 46	20 33	20 22	20 12	19 55	19 40	19 26	19 12	18 57	18 40	18 31	18 19
17	22 05	21 46	21 31	21 19	21 09	21 00	20 45	20 31	20 18	20 05	19 52	19 36	19 27	19 17
18	22 38	22 23	22 10	22 00	21 51	21 44	21 30	21 19	21 08	20 57	20 45	20 32	20 24	20 15
19	23 06	22 54	22 44	22 36	22 29	22 23	22 13	22 03	21 55	21 46	21 37	21 26	21 20	21 13
20	23 30	23 21	23 15	23 09	23 04	23 00	22 52	22 46	22 40	22 33	22 27	22 19	22 15	22 10
21	23 51	23 46	23 42	23 39	23 36	23 34	23 30	23 26	23 23	23 19	23 16	23 11	23 09	23 06
22	.. ..	0 10	0 09	0 08	0 08	0 07	0 06	0 05	0 05	0 04	0 04	0 03	0 02	0 02
23	0 11	0 33	0 35	0 37	0 39	0 40	0 43	0 45	0 47	0 49	0 52	0 54	0 56	0 58
24	0 51	0 57	1 03	1 07	1 11	1 14	1 20	1 25	1 30	1 35	1 40	1 46	1 50	1 54
25	1 14	1 24	1 32	1 39	1 45	1 50	1 59	2 07	2 14	2 22	2 30	2 40	2 45	2 51
26	1 40	1 53	2 04	2 14	2 21	2 28	2 40	2 51	3 01	3 11	3 22	3 34	3 41	3 50
27	2 11	2 28	2 42	2 53	3 02	3 11	3 25	3 38	3 50	4 02	4 15	4 30	4 39	4 49
28	2 50	3 09	3 25	3 37	3 48	3 58	4 14	4 29	4 42	4 56	5 10	5 27	5 36	5 48
29	3 37	3 58	4 15	4 28	4 40	4 50	5 07	5 22	5 36	5 51	6 06	6 23	6 33	6 45
30	4 35	4 56	5 12	5 25	5 37	5 46	6 03	6 18	6 32	6 46	7 01	7 18	7 28	7 39
31	5 42	6 01	6 15	6 28	6 38	6 47	7 02	7 16	7 28	7 41	7 55	8 10	8 19	8 29
32	6 56	7 11	7 23	7 33	7 42	7 49	8 02	8 14	8 24	8 35	8 46	8 59	9 06	9 15
33	8 14	8 25	8 34	8 41	8 48	8 53	9 03	9 11	9 19	9 27	9 35	9 44	9 50	9 56

MOONSET

Dec.	9	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
10	1 17	1 20	1 21	1 23	1 24	1 25	1 27	1 29	1 31	1 32	1 34	1 36	1 37	1 38
11	1 43	1 49	1 55	1 59	2 03	2 07	2 13	2 18	2 23	2 28	2 34	2 40	2 43	2 47
12	2 10	2 22	2 30	2 38	2 44	2 50	3 00	3 08	3 17	3 25	3 33	3 43	3 49	3 56
13	2 42	2 57	3 10	3 20	3 28	3 36	3 49	4 00	4 11	4 22	4 34	4 47	4 55	5 03
14	3 20	3 39	3 53	4 05	4 16	4 25	4 40	4 54	5 07	5 20	5 33	5 49	5 58	6 09
15	4 05	4 26	4 42	4 56	5 07	5 17	5 34	5 49	6 03	6 17	6 32	6 49	6 59	7 10
16	4 58	5 19	5 36	5 50	6 01	6 11	6 29	6 44	6 58	7 12	7 27	7 44	7 54	8 06
17	5 57	6 18	6 33	6 46	6 57	7 07	7 24	7 38	7 51	8 05	8 19	8 35	8 45	8 56
18	7 01	7 19	7 33	7 45	7 54	8 03	8 18	8 30	8 42	8 54	9 07	9 21	9 30	9 39
19	8 08	8 22	8 33	8 43	8 51	8 58	9 10	9 21	9 31	9 41	9 51	10 03	10 10	10 18
20	9 14	9 25	9 33	9 40	9 46	9 52	10 01	10 09	10 17	10 24	10 32	10 41	10 46	10 52
21	10 20	10 27	10 33	10 37	10 41	10 44	10 50	10 56	11 00	11 05	11 10	11 16	11 20	11 23
22	11 26	11 29	11 31	11 33	11 35	11 36	11 39	11 41	11 43	11 45	11 47	11 50	11 51	11 53
23	12 31	12 30	12 29	12 29	12 28	12 28	12 27	12 26	12 25	12 25	12 24	12 23	12 22	12 22
24	13 37	13 32	13 28	13 25	13 22	13 19	13 15	13 11	13 08	13 04	13 00	12 56	12 54	12 51
25	14 43	14 34	14 27	14 21	14 16	14 12	14 04	13 58	13 51	13 45	13 38	13 31	13 26	13 21
26	15 50	15 37	15 27	15 19	15 12	15 06	14 55	14 45	14 37	14 28	14 18	14 08	14 01	13 55
27	16 57	16 41	16 28	16 18	16 09	16 01	15 47	15 35	15 24	15 13	15 01	14 48	14 40	14 31
28	18 03	17 44	17 29	17 17	17 06	16 57	16 41	16 28	16 15	16 02	15 48	15 32	15 23	15 13
29	19 05	18 45	18 28	18 15	18 04	17 54	17 37	17 22	17 08	16 54	16 39	16 22	16 12	16 01
30	20 02	19 41	19 24	19 11	18 59	18 49	18 32	18 17	18 03	17 49	17 34	17 16	17 06	16 54
31	20 50	20 31	20 16	20 03	19 52	19 43	19 27	19 12	18 59	18 46	18 31	18 15	18 05	17 54
32	21 31	21 15	21 02	20 51	20 41	20 33	20 19	20 07	19 55	19 43	19 31	19 16	19 08	18 58
33	22 05	21 52	21 42	21 34	21 27	21 20	21 09	21 00	20 50	20 41	20 31	20 20	20 13	20 05
34	22 34	22 26	22 19	22 14	22 09	22 05	21 57	21 50	21 44	21 38	21 31	21 23	21 19	21 14

.. .. indicates phenomenon will occur the next day.

UNIVERSAL TIME FOR MERIDIAN OF GREENWICH
MOONRISE

Lat.	+40°	+42°	+44°	+46°	+48°	+50°	+52°	+54°	+56°	+58°	+60°	+62°	+64°	+66°
Dec. 9	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
10	13 43	13 42	13 40	13 39	13 38	13 36	13 35	13 33	13 31	13 29	13 27	13 24	13 21	13 18
11	14 20	14 18	14 15	14 13	14 10	14 07	14 04	14 00	13 56	13 52	13 47	13 42	13 36	13 28
12	15 00	14 57	14 53	14 49	14 45	14 41	14 36	14 31	14 25	14 19	14 11	14 03	13 53	13 42
13	15 44	15 39	15 35	15 30	15 25	15 19	15 13	15 06	14 59	14 50	14 41	14 30	14 16	14 01
14	16 32	16 27	16 22	16 16	16 10	16 04	15 56	15 48	15 39	15 29	15 18	15 04	14 48	14 28
15	17 24	17 19	17 13	17 07	17 01	16 54	16 46	16 38	16 28	16 17	16 04	15 50	15 32	15 09
16	18 19	18 14	18 09	18 03	17 57	17 50	17 42	17 34	17 24	17 13	17 01	16 46	16 29	16 07
17	19 17	19 12	19 07	19 02	18 56	18 50	18 43	18 35	18 27	18 17	18 06	17 52	17 37	17 18
18	20 15	20 11	20 07	20 02	19 57	19 52	19 46	19 40	19 32	19 24	19 15	19 04	18 51	18 36
19	21 13	21 10	21 06	21 03	20 59	20 55	20 50	20 45	20 40	20 33	20 26	20 18	20 08	19 57
20	22 10	22 08	22 05	22 03	22 00	21 57	21 54	21 51	21 47	21 42	21 37	21 32	21 25	21 18
21	23 06	23 05	23 04	23 02	23 01	22 59	22 57	22 55	22 53	22 51	22 48	22 45	22 42	22 38
22	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	23 59	23 59	23 58	23 57	23 57
23	0 02	0 02	0 01	0 01	0 01	0 01	0 00	0 00	0 00	.. ..	.. ..	.. ..	.. ..	.. ..
24	0 58	0 58	0 59	1 00	1 01	1 02	1 03	1 04	1 06	1 07	1 09	1 11	1 13	1 16
25	1 54	1 56	1 58	2 00	2 02	2 04	2 07	2 10	2 13	2 16	2 20	2 25	2 30	2 36
26	2 51	2 54	2 57	3 00	3 03	3 07	3 11	3 16	3 20	3 26	3 32	3 39	3 48	3 57
27	3 50	3 53	3 57	4 01	4 06	4 11	4 16	4 22	4 29	4 36	4 45	4 55	5 06	5 20
28	4 49	4 53	4 58	5 03	5 08	5 14	5 21	5 28	5 37	5 46	5 56	6 09	6 24	6 42
29	5 48	5 53	5 58	6 04	6 10	6 17	6 24	6 32	6 42	6 52	7 05	7 19	7 37	7 58
30	6 45	6 50	6 56	7 02	7 08	7 15	7 23	7 32	7 42	7 53	8 06	8 21	8 40	9 03
31	7 39	7 44	7 50	7 55	8 02	8 09	8 16	8 25	8 34	8 45	8 57	9 12	9 29	9 51
32	8 29	8 34	8 39	8 44	8 49	8 56	9 02	9 10	9 18	9 27	9 38	9 51	10 05	10 23
33	9 15	9 18	9 22	9 27	9 31	9 36	9 42	9 48	9 54	10 02	10 10	10 20	10 31	10 45
34	9 56	9 59	10 02	10 05	10 08	10 12	10 16	10 20	10 25	10 30	10 36	10 43	10 51	11 00

MOONSET

Dec. 9	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
10	1 38	1 39	1 40	1 40	1 41	1 42	1 42	1 43	1 44	1 45	1 47	1 48	1 49	1 51
11	2 47	2 49	2 51	2 53	2 55	2 57	3 00	3 03	3 06	3 09	3 13	3 17	3 23	3 29
12	3 56	3 59	4 02	4 05	4 09	4 12	4 17	4 21	4 27	4 32	4 39	4 47	4 55	5 06
13	5 03	5 07	5 11	5 16	5 21	5 26	5 32	5 38	5 45	5 53	6 02	6 13	6 25	6 40
14	6 09	6 13	6 18	6 24	6 29	6 36	6 43	6 50	6 59	7 09	7 20	7 33	7 49	8 08
15	7 10	7 15	7 20	7 26	7 33	7 40	7 47	7 56	8 05	8 16	8 29	8 43	9 01	9 23
16	8 06	8 11	8 16	8 22	8 29	8 36	8 43	8 52	9 01	9 12	9 25	9 40	9 57	10 20
17	8 56	9 00	9 05	9 11	9 17	9 23	9 31	9 39	9 47	9 57	10 09	10 22	10 38	10 58
18	9 39	9 43	9 48	9 53	9 58	10 04	10 10	10 17	10 24	10 33	10 43	10 54	11 07	11 23
19	10 18	10 21	10 25	10 29	10 33	10 37	10 43	10 48	10 54	11 01	11 09	11 18	11 28	11 40
20	10 52	10 54	10 57	11 00	11 03	11 07	11 10	11 14	11 19	11 24	11 30	11 36	11 43	11 52
21	11 23	11 25	11 27	11 29	11 31	11 33	11 35	11 38	11 40	11 44	11 47	11 51	11 56	12 01
22	11 53	11 54	11 54	11 55	11 56	11 57	11 58	11 59	12 00	12 01	12 03	12 04	12 06	12 08
23	12 22	12 21	12 21	12 21	12 20	12 20	12 20	12 19	12 19	12 18	12 18	12 17	12 16	12 16
24	12 51	12 50	12 48	12 47	12 45	12 44	12 42	12 40	12 38	12 36	12 33	12 30	12 27	12 23
25	13 21	13 19	13 17	13 14	13 12	13 09	13 06	13 02	12 58	12 54	12 50	12 44	12 38	12 31
26	13 55	13 51	13 48	13 45	13 41	13 37	13 32	13 27	13 22	13 16	13 09	13 01	12 52	12 41
27	14 31	14 27	14 23	14 19	14 14	14 09	14 03	13 56	13 49	13 41	13 32	13 22	13 10	12 55
28	15 13	15 08	15 03	14 58	14 52	14 46	14 39	14 32	14 23	14 13	14 02	13 50	13 34	13 16
29	16 01	15 55	15 50	15 44	15 38	15 31	15 23	15 15	15 05	14 54	14 42	14 27	14 10	13 48
30	16 54	16 49	16 44	16 38	16 31	16 24	16 16	16 07	15 58	15 46	15 33	15 18	15 00	14 36
31	17 54	17 49	17 44	17 38	17 32	17 25	17 18	17 10	17 00	16 50	16 38	16 23	16 06	15 45
32	18 58	18 54	18 50	18 45	18 39	18 33	18 27	18 20	18 12	18 03	17 53	17 41	17 26	17 09
33	20 05	20 02	19 59	19 55	19 50	19 46	19 41	19 35	19 29	19 22	19 15	19 06	18 55	18 42
34	21 14	21 12	21 09	21 06	21 04	21 01	20 57	20 54	20 49	20 45	20 40	20 34	20 27	20 19

.. .. indicates phenomenon will occur the next day.

There are four eclipses, two of the Sun and two of the Moon.

I	March 8-9	Total eclipse of the Sun
II	March 24	Partial eclipse of the Moon
III	September 1-2	Partial eclipse of the Sun
IV	September 16	Total eclipse of the Moon

Standard corrections of $+0''.5$ and $-0''.25$ have been applied to the tabular longitude and latitude of the Moon, respectively, to help correct for the difference between the center of figure and the center of mass.

All time arguments are given provisionally in Universal Time, using $\Delta T(A) = +63^s$. Once the value of ΔT is known, the data on these pages may be expressed in Universal Time as follows:

Define $\delta T = \Delta T - \Delta T(A)$, in units of seconds of time.

Change the time arguments of the tables and the times of circumstances given in provisional Universal Time by subtracting δT . Then apply the correction $0.00417807 \delta T$ degrees to μ and the longitudes in such a way that if δT is positive, μ decreases and the longitudes shift to the east.

Leave all other quantities unchanged.

This correction procedure is included in the polynomial representation of the Besselian elements.

Longitude is positive to the east, and negative to the west.

I.—Total Eclipse of the Sun, March 8-9.

ELEMENTS OF THE ECLIPSE

UT of geocentric conjunction in right ascension, March 9^d 1^h 53^m 35^s.904

Julian Date = 2450516.5788877816

R.A. of Sun and Moon	h m s			Hourly motions	s	
	23	17	50.707		9.233	and 144.875
Declination of Sun	—	4	32 00.05	Hourly motion	+ 0 58.65	
Declination of Moon	—	3	33 13.40	Hourly motion	+11 36.79	
Equatorial hor. par. of Sun	8.86			True semidiameter of Sun	16 06.5	
Equatorial hor. par. of Moon	61 12.57			True semidiameter of Moon	16 40.8	

CIRCUMSTANCES OF THE ECLIPSE

	March	UT			Longitude		Latitude	
		d	h	m	°	'	°	'
Eclipse begins		8	23	16.6	+105	08.1	+19	17.6
Central eclipse begins		9	0	43.4	+ 87	09.5	+49	26.7
Central eclipse at local apparent noon		9	1	53.6	+154	15.7	+70	29.1
Central eclipse ends		9	2	03.8	—158	14.4	+82	57.7
Eclipse ends		9	3	30.8	—146	18.2	+54	08.2

I.—Total Eclipse of the Sun, March 8–9 (continued)

BESSELIAN ELEMENTS, POLYNOMIAL FORM

The equations below represent simple least-squares fits to the tabular Besselian elements.

Let $t = (\text{UT} - 23^{\text{h}}) + \delta T/3600$, in units of hours. For times on 9 March, add 24^{h} to the UT before computing t .

These equations are valid over the range $0^{\text{h}}208 \leq t \leq 4^{\text{h}}683$. Do not use t outside the given range, and do not omit any terms in the series.

$$\begin{aligned} x &= -1.60366094 + 0.55414472\,t + 0.00006886\,t^2 - 0.00000934\,t^3 \\ y &= 0.45808121 + 0.17440613\,t - 0.00000355\,t^2 - 0.00000284\,t^3 \\ \sin d &= -0.07987889 + 0.00027580\,t + 0.00000007\,t^2 - 0.00000001\,t^3 \\ \cos d &= 0.99680458 + 0.00002209\,t - 0.00000003\,t^2 \\ \mu &= 162.32748106 + 15.00395560\,t + 0.00000130\,t^2 - 0.00000001\,t^3 - 0.00417807\,\delta T \\ \text{Radius of:} \\ \text{penumbra} &= 0.53676302 + 0.00009993\,t - 0.00001293\,t^2 \\ \text{umbra} &= -0.00957478 + 0.00009944\,t - 0.00001288\,t^2 \end{aligned}$$

II.—Partial Eclipse of the Moon, March 24; the beginning of the umbral phase visible in North America except Alaska and northwestern Canada, Central America, South America, Europe, extreme western Asia, Africa except the eastern extremity, Greenland, parts of Antarctica (including Marie Byrd Land, the Palmer Peninsula, and Queen Maud Land), the eastern South Pacific Ocean, the southeastern North Pacific Ocean, and the Atlantic Ocean; the end visible in North America except the western Aleutian Islands, Hawaii, the North Island of New Zealand, Central America, South America, most of Greenland, extreme western Europe, the western extremity of Africa, parts of Antarctica (including Victoria Land, Marie Byrd Land, the Palmer Peninsula, and part of Queen Maud Land), the eastern half of the Pacific Ocean, the North Atlantic Ocean, and the western South Atlantic Ocean.

ELEMENTS OF THE ECLIPSE

UT of geocentric opposition in right ascension, March 24^d 4^h 21^m 01^s.865
Julian Date = 2450531.6812715880

	h	m	s		s			
R.A. of Sun	0	13	06.899	Hourly motion	9.097			
R.A. of Moon	12	13	06.899	Hourly motion	114.885			
	°	'	''		'	''		
Declination of Sun	+	1	25	13.48	Hourly motion	+	0	59.03
Declination of Moon	−	0	57	12.22	Hourly motion	−	9	23.84
Equatorial hor. par. of Sun			8.82	True semidiameter of Sun	16	02.5		
Equatorial hor. par. of Moon		54	31.03	True semidiameter of Moon	14	51.3		

CIRCUMSTANCES OF THE ECLIPSE

		d	h	m	
Moon enters penumbra	March	24	1	40.6	
Moon enters umbra		24	2	57.5	
Middle of eclipse		24	4	39.4	UT
Moon leaves umbra		24	6	21.3	
Moon leaves penumbra		24	7	38.1	
Contacts of Umbra with Limb of Moon	Position Angles from the North Point	The Moon being in the Zenith in Longitude Latitude			
	°	°	'	°	'
First	137.2 to East	−	43	24.1	− 0 44.1
Last	101.9 to West	−	92	51.3	− 1 16.0

Magnitude of the eclipse: 0.924

III.—*Partial Eclipse of the Sun, September 1–2.*

ELEMENTS OF THE ECLIPSE

UT of geocentric conjunction in right ascension, September 2^d 0^h 40^m 01^s.540

Julian Date = 2450693.5277956044

	h	m	s		s	s
R.A. of Sun and Moon	10	44	36.906	Hourly motions	9.059	and 114.192
	°	'	"		'	"
Declination of Sun	+ 7	58	17.78	Hourly motion	– 0	54.67
Declination of Moon	+ 7	00	11.13	Hourly motion	– 8	36.60
Equatorial hor. par. of Sun			8.72	True semidiameter of Sun	15	51.1
Equatorial hor. par. of Moon	53	58.65		True semidiameter of Moon	14	42.5

CIRCUMSTANCES OF THE ECLIPSE

		UT	Longitude	Latitude
	d	h	m	
Eclipse begins	September	1	21 44.1	+127 40.3
Greatest eclipse		2	0 03.7	+114 21.3
Eclipse ends		2	2 23.1	–138 20.4
				–57 09.2

Magnitude of greatest eclipse: 0.899

BESSELIAN ELEMENTS, POLYNOMIAL FORM

The equations below represent simple least-squares fits to the tabular Besselian elements.

Let $t = (\text{UT} - 21^{\text{h}}) + \delta T/3600$, in units of hours. For times on 2 September, add 24^h to the UT before computing t .These equations are valid over the range $0^{\text{h}}.625 \leq t \leq 5^{\text{h}}.558$. Do not use t outside the given range, and do not omit any terms in the series.

$$\begin{aligned}
 x &= -1.77707769 + 0.48450530 t + 0.00004600 t^2 - 0.00000543 t^3 \\
 y &= -0.55492493 - 0.14300071 t - 0.00001690 t^2 + 0.00000154 t^3 \\
 \sin d &= 0.13966760 - 0.00025619 t - 0.00000006 t^2 \\
 \cos d &= 0.99019840 + 0.00003619 t - 0.00000004 t^2 \\
 \mu &= 135.03844706 + 15.00449820 t + 0.00000092 t^2 - 0.00417807 \delta T
 \end{aligned}$$

Radius of

$$\text{penumbra} = 0.56750766 + 0.00008027 t - 0.00000967 t^2 - 0.00000001 t^3$$

IV.—*Total Eclipse of the Moon, September 16; the beginning of the umbral phase visible in eastern Europe, Asia, the eastern half of Africa, Australia, New Zealand, the western Aleutian Islands, parts of Antarctica (including Queen Maud Land, Wilkes Land, and Victoria Land), the Indian Ocean, and the western half of the Pacific Ocean; the end visible in extreme eastern South America, Europe, extreme eastern Greenland, Asia except the extreme east, Africa, Australia except the east coast, parts of Antarctica (including Queen Maud Land, Wilkes Land, and part of Victoria Land), the eastern North Atlantic Ocean, most of the South Atlantic Ocean, and the Indian Ocean.*

IV.—*Total Eclipse of the Moon*, September 16 (continued).

ELEMENTS OF THE ECLIPSE

UT of geocentric opposition in right ascension, September 16^d 18^h 34^m 16^s.071

Julian Date = 2450708.2737971223

	h	m	s		s	
R.A. of Sun	11	37	40.708	Hourly motion	8.961	
R.A. of Moon	23	37	40.708	Hourly motion	145.560	
	°	'	"		'	"
Declination of Sun	+	2	24	49.86	Hourly motion	− 0 57.90
Declination of Moon	−	2	49	07.55	Hourly motion	+11 49.97
Equatorial hor. par. of Sun			8.75	True semidiameter of Sun	15 54.7	
Equatorial hor. par. of Moon		61	25.48	True semidiameter of Moon	16 44.3	

CIRCUMSTANCES OF THE ECLIPSE

		d	h	m	
Moon enters penumbra	September	16	16	11.0	
Moon enters umbra		16	17	08.0	
Moon enters totality		16	18	15.4	
Middle of eclipse		16	18	46.6	UT
Moon leaves totality		16	19	17.9	
Moon leaves umbra		16	20	25.2	
Moon leaves penumbra		16	21	22.2	
Contacts of Umbra with Limb of Moon	Position Angles from the North Point	The Moon being in the Zenith in			
		Longitude		Latitude	
		°	'	°	'
First	50.8 to East	+100	51.2	− 3	06.1
Last	86.2 to West	+ 53	25.1	− 2	27.2

Magnitude of the eclipse: 1.197

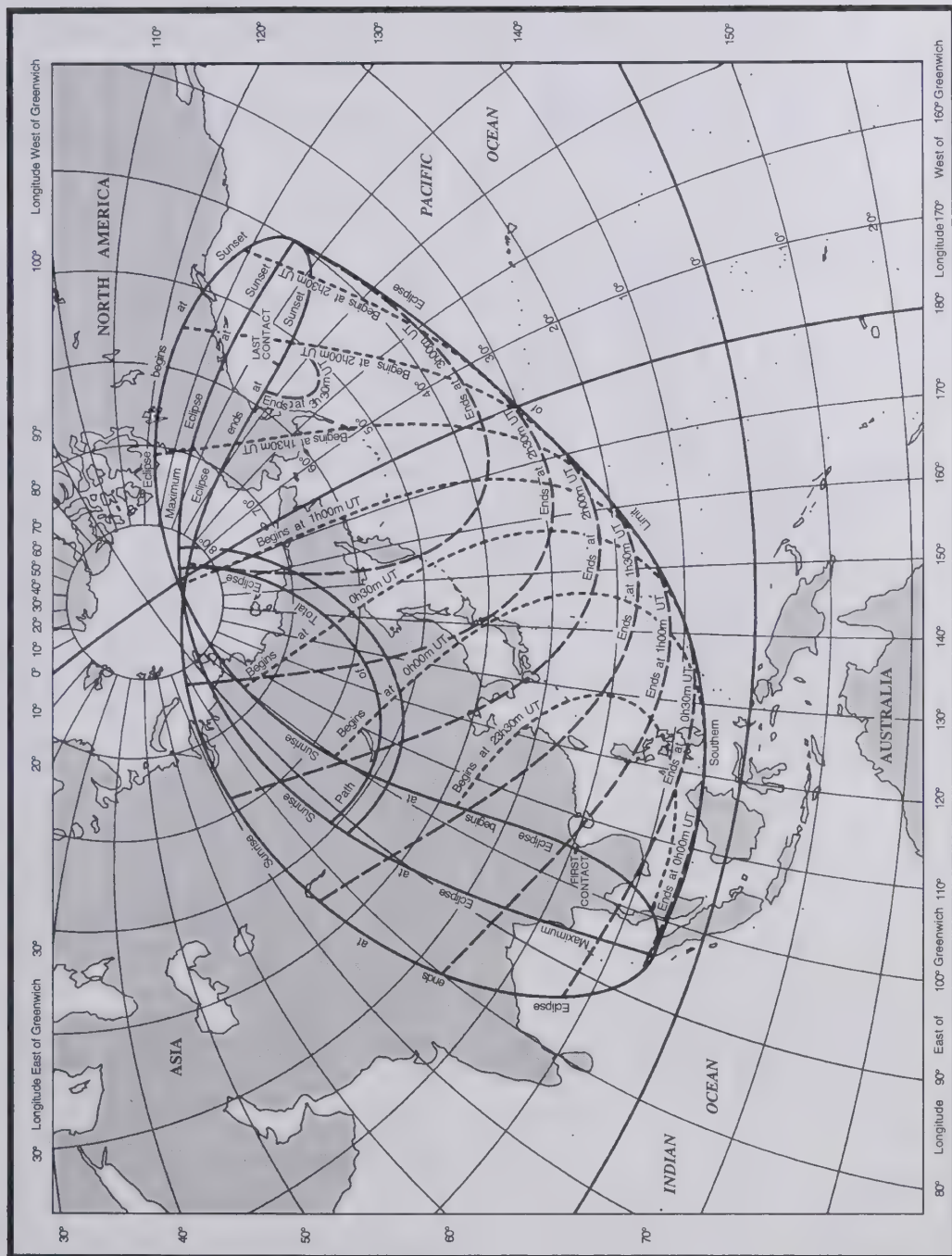
BESSELIAN ELEMENTS: TOTAL SOLAR ECLIPSE OF MARCH 8-9

UT	Intersection of Axis of Shadow with Fundamental Plane		Direction of Axis of Shadow			Radius of Shadow on Fundamental Plane	
	x	y	sin <i>d</i>	cos <i>d</i>	μ	Penumbra	Umbra
h m					°		
22 50	-1.696016	+0.429014	-0.079925	0.996801	159.82682	0.536746	-0.009592
23 00	-1.603661	+0.458081	-0.079879	0.996805	162.32748	0.536763	-0.009575
10	1.511302	0.487149	.079833	.996808	164.82814	.536779	.009559
20	1.418939	0.516216	.079787	.996812	167.32880	.536795	.009543
30	1.326573	0.545283	.079741	.996816	169.82946	.536810	.009528
40	1.234203	0.574350	.079695	.996819	172.33012	.536824	.009514
50	1.141831	0.603416	.079649	.996823	174.83078	.536837	.009501
0 00	-1.049457	+0.632481	-0.079603	0.996827	177.33144	0.536850	-0.009488
10	0.957080	0.661546	.079557	.996830	179.83210	.536862	.009476
20	0.864701	0.690610	.079511	.996834	182.33276	.536873	.009465
30	0.772320	0.719673	.079465	.996838	184.83342	.536884	.009455
40	0.679938	0.748735	.079419	.996841	187.33408	.536894	.009445
50	0.587555	0.777796	.079373	.996845	189.83474	.536903	.009436
1 00	-0.495171	+0.806857	-0.079327	0.996849	192.33540	0.536911	-0.009427
10	0.402786	0.835916	.079281	.996852	194.83606	.536919	.009420
20	0.310400	0.864973	.079235	.996856	197.33672	.536926	.009413
30	0.218015	0.894030	.079189	.996860	199.83738	.536932	.009407
40	0.125629	0.923085	.079143	.996863	202.33804	.536937	.009401
50	-0.033244	0.952139	.079097	.996867	204.83870	.536942	.009396
2 00	+0.059141	+0.981191	-0.079051	0.996871	207.33936	0.536946	-0.009392
10	0.151525	1.010242	.079005	.996874	209.84002	.536950	.009389
20	0.243907	1.039290	.078959	.996878	212.34068	.536952	.009386
30	0.336289	1.068338	.078913	.996882	214.84134	.536954	.009385
40	0.428669	1.097383	.078867	.996885	217.34200	.536955	.009383
50	0.521046	1.126426	.078821	.996889	219.84266	.536956	.009383
3 00	+0.613422	+1.155467	-0.078775	0.996892	222.34332	0.536956	-0.009383
10	0.705796	1.184507	.078729	.996896	224.84398	.536955	.009384
20	0.798166	1.213544	.078683	.996900	227.34465	.536953	.009386
30	0.890534	1.242578	.078637	.996903	229.84531	.536951	.009388
40	0.982899	1.271611	.078591	.996907	232.34597	.536947	.009391
50	1.075260	1.300641	.078545	.996911	234.84663	.536944	.009395
4 00	+1.167617	+1.329669	-0.078499	0.996914	237.34729	0.536939	-0.009400
		$\tan f_1$	0.004709				
		$\tan f_2$	0.004685				
		μ'	0.261869	radians per hour			
		d'	+0.000277	radians per hour			

PATH OF CENTRAL PHASE: TOTAL SOLAR ECLIPSE OF MARCH 8-9

U.T.	Northern Limit		Central Line		Southern Limit		Central Line	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration	Alt.
Limits	[°] +50 52.2	[°] + 86 50.4	[°] +49 26.7	[°] + 87 09.5	[°] +48 06.0	[°] + 87 28.0	^m 2 01.0	[°] —
^h 0 44	.. ..	... ..	+49 07.8	+ 92 55.6	+47 42.8	+ 99 59.8	2 08.9	4
46	+50 41.2	+ 89 59.1	49 08.8	98 49.3	47 54.2	103 29.6	2 17.7	8
48	50 38.5	97 13.7	49 21.3	102 26.7	48 09.8	106 15.5	2 23.3	10
0 50	+50 51.7	+101 05.5	+49 38.2	+105 16.7	+48 28.1	+108 36.4	2 27.8	12
52	51 09.8	104 02.5	49 57.7	107 40.3	48 48.2	110 40.9	2 31.5	14
54	51 30.5	106 30.6	50 19.1	109 46.8	49 09.8	112 33.5	2 34.7	15
56	51 53.3	108 40.3	50 42.1	111 41.1	49 32.7	114 17.3	2 37.6	16
58	52 17.6	110 37.2	51 06.3	113 26.4	49 56.7	115 54.1	2 40.1	17
1 00	+52 43.2	+112 24.6	+51 31.7	+115 04.6	+50 21.7	+117 25.5	2 42.3	18
02	53 10.0	114 04.7	51 58.1	116 37.2	50 47.7	118 52.3	2 44.3	19
04	53 37.9	115 39.0	52 25.4	118 05.4	51 14.6	120 15.5	2 46.1	20
06	54 06.9	117 08.7	52 53.8	119 29.8	51 42.3	121 35.7	2 47.6	20
08	54 36.8	118 34.7	53 23.0	120 51.3	52 10.9	122 53.4	2 49.0	21
1 10	+55 07.7	+119 57.7	+53 53.1	+122 10.3	+52 40.3	+124 09.1	2 50.1	21
12	55 39.6	121 18.3	54 24.2	123 27.4	53 10.6	125 23.1	2 51.1	22
14	56 12.6	122 37.0	54 56.2	124 43.0	53 41.7	126 36.0	2 52.0	22
16	56 46.5	123 54.2	55 29.1	125 57.4	54 13.7	127 47.8	2 52.6	22
18	57 21.4	125 10.4	56 02.9	127 11.0	54 46.6	128 59.0	2 53.1	23
1 20	+57 57.5	+126 25.8	+56 37.8	+128 24.0	+55 20.4	+130 09.8	2 53.4	23
22	58 34.6	127 40.9	57 13.6	129 36.9	55 55.1	131 20.6	2 53.6	23
24	59 13.0	128 55.9	57 50.6	130 49.8	56 30.8	132 31.4	2 53.6	23
26	59 52.6	130 11.2	58 28.7	132 03.1	57 07.6	133 42.8	2 53.5	23
28	60 33.5	131 27.3	59 08.0	133 17.2	57 45.5	134 54.8	2 53.2	23
1 30	+61 15.9	+132 44.3	+59 48.6	+134 32.3	+58 24.6	+136 07.9	2 52.7	23
32	61 59.9	134 02.9	60 30.7	135 48.8	59 04.9	137 22.3	2 52.1	22
34	62 45.5	135 23.3	61 14.2	137 07.2	59 46.6	138 38.5	2 51.3	22
36	63 33.1	136 46.1	61 59.3	138 27.8	60 29.7	139 56.7	2 50.4	22
38	64 22.7	138 12.0	62 46.3	139 51.3	61 14.4	141 17.6	2 49.3	21
1 40	+65 14.6	+139 41.7	+63 35.2	+141 18.2	+62 00.9	+142 41.6	2 48.0	21
42	66 09.3	141 16.1	64 26.4	142 49.3	62 49.3	144 09.4	2 46.5	20
44	67 06.9	142 56.3	65 20.1	144 25.7	63 39.8	145 41.7	2 44.8	20
46	68 08.1	144 44.0	66 16.7	146 08.4	64 32.8	147 19.7	2 42.9	19
48	69 13.6	146 41.3	67 16.7	147 59.3	65 28.6	149 04.5	2 40.8	18
1 50	+70 24.4	+148 51.3	+68 20.7	+150 00.5	+66 27.6	+150 57.9	2 38.4	17
52	71 41.8	151 18.7	69 29.7	152 15.1	67 30.4	153 02.2	2 35.8	16
54	73 08.0	154 11.4	70 44.7	154 48.2	68 37.9	155 20.6	2 32.8	15
56	74 46.8	157 44.1	72 07.8	157 47.7	69 51.2	157 58.1	2 29.3	13
58	76 46.1	162 30.6	73 42.3	161 28.1	71 12.0	161 02.8	2 25.3	12
2 00	+79 28.5	+170 25.8	+75 34.3	+166 20.9	+72 43.2	+164 48.9	2 20.5	9
02	.. ..	... ..	78 00.6	+174 01.6	74 30.4	169 46.6	2 14.1	7
2 03	.. ..	... ..	+79 45.4	-178 57.4	+75 33.5	+173 03.5	2 09.4	4
Limits	+83 58.7	-166 26.2	+82 57.7	-158 14.4	+81 53.3	-152 38.2	2 00.3	—

TOTAL SOLAR ECLIPSE OF 8-9 MARCH 1997



BESSELIAN ELEMENTS: PARTIAL SOLAR ECLIPSE OF SEPTEMBER 1-2

UT	Intersection of Axis of Shadow with Fundamental Plane		Direction of Axis of Shadow			Radius of Shadow on Fundamental Plane Penumbra
	x	y	τ sin d	cos d	μ	
h m					°	
21 20	-1.615571	-0.602594	+0.139582	0.990210	140.03995	0.567533
30	1.534814	0.626429	.139540	.990217	142.54070	.567545
40	1.454055	0.650266	.139497	.990223	145.04145	.567557
50	1.373295	0.674103	.139454	.990229	147.54220	.567568
22 00	-1.292532	-0.697941	+0.139411	0.990235	150.04295	0.567578
10	1.211768	0.721780	.139369	.990241	152.54370	.567588
20	1.131002	0.745619	.139326	.990247	155.04445	.567597
30	1.050235	0.769459	.139283	.990253	157.54520	.567606
40	0.969466	0.793299	.139240	.990259	160.04595	.567615
50	0.888697	0.817140	.139198	.990265	162.54670	.567622
23 00	-0.807927	-0.840982	+0.139155	0.990271	165.04745	0.567629
10	0.727155	0.864823	.139112	.990277	167.54820	.567636
20	0.646384	0.888666	.139070	.990283	170.04895	.567642
30	0.565612	0.912508	.139027	.990289	172.54970	.567648
40	0.484839	0.936351	.138984	.990295	175.05045	.567653
50	0.404067	0.960194	.138941	.990301	177.55120	.567657
0 00	-0.323294	-0.984038	+0.138899	0.990307	180.05195	0.567661
10	0.242522	1.007881	.138856	.990313	182.55270	.567665
20	0.161750	1.031725	.138813	.990319	185.05345	.567668
30	0.080978	1.055568	.138770	.990325	187.55420	.567670
40	-0.000207	1.079412	.138728	.990331	190.05495	.567672
50	+0.080563	1.103256	.138685	.990337	192.55570	.567673
1 00	+0.161332	-1.127100	+0.138642	0.990343	195.05645	0.567674
10	0.242100	1.150943	.138599	.990349	197.55721	.567674
20	0.322867	1.174787	.138557	.990355	200.05796	.567673
30	0.403633	1.198630	.138514	.990361	202.55871	.567672
40	0.484397	1.222473	.138471	.990366	205.05946	.567671
50	0.565160	1.246316	.138428	.990372	207.56021	.567669
2 00	+0.645920	-1.270158	+0.138386	0.990378	210.06096	0.567666
10	0.726679	1.294001	.138343	.990384	212.56171	.567663
20	0.807436	1.317842	.138300	.990390	215.06246	.567660
30	0.888190	1.341684	.138257	.990396	217.56321	.567656
40	0.968942	1.365525	.138214	.990402	220.06397	.567651
50	+1.049691	-1.389365	+0.138172	0.990408	222.56472	0.567646

$\tan f_1$

μ'

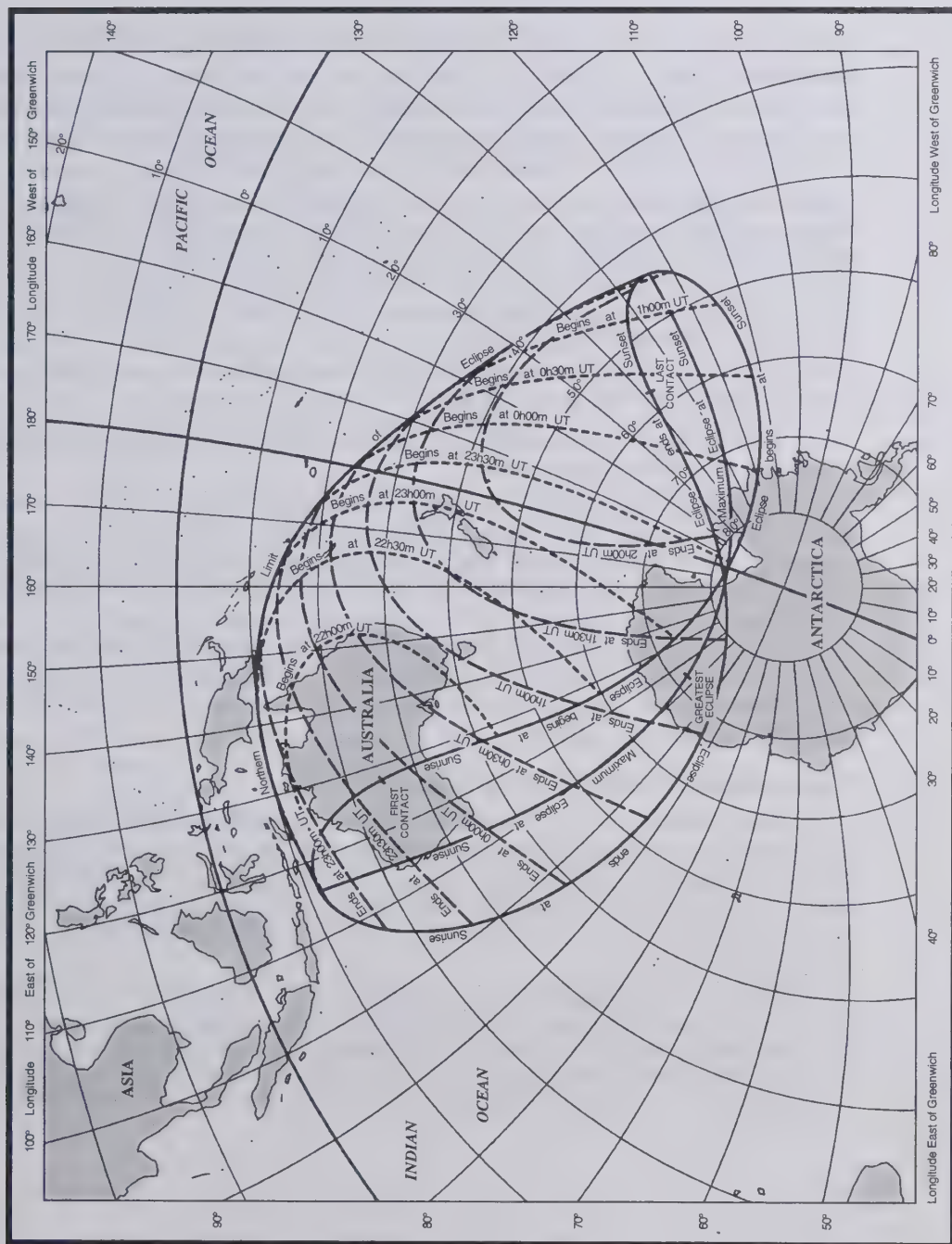
d'

0.004635

0.261878 radians per hour

-0.000259 radians per hour

PARTIAL SOLAR ECLIPSE OF 1-2 SEPTEMBER 1997



Joint publications of the Royal Greenwich Observatory and the United States Naval Observatory

Except for the *Explanatory Supplement*, these publications are available from HMSO and from the Superintendent of Documents, U.S. Government Printing Office. Their addresses are listed on the reverse of the title page of this volume.

The Astronomical Almanac contains ephemerides of the Sun, Moon, planets and their natural satellites, as well as data on eclipses and other astronomical phenomena. The data in this annual volume are calculated cooperatively by the British and American offices, with contributions from the Bureau des Longitudes, Astronomisches Rechen-Institut, the Institute of Theoretical Astronomy, St. Petersburg, and B.G. Marsden, Smithsonian Astrophysical Observatory.

The Nautical Almanac contains ephemerides at an interval of one hour and auxiliary astronomical data for marine navigation.

The Air Almanac contains ephemerides at an interval of ten minutes and auxiliary astronomical data for air navigation.

Planetary and Lunar Coordinates, 1984–2000 provides low-precision astronomical data for use in advance of the annual ephemerides and for other purposes. It contains heliocentric, geocentric, spherical and rectangular coordinates of the Sun, Moon and planets, eclipse data, and auxiliary data, such as orbital elements and precessional constants.

Explanatory Supplement to The Astronomical Ephemeris and The American Ephemeris and Nautical Almanac was published by Her Majesty's Stationery Office but is now out of print. A new *Explanatory Supplement to The Astronomical Almanac* has been prepared, see below.

Other publications of the Royal Greenwich Observatory

The Star Almanac for Land Surveyors contains the Greenwich hour angle of Aries and the position of the Sun, tabulated for every six hours, and represented by monthly polynomial coefficients. Positions of all stars brighter than magnitude 4.0 are tabulated monthly to a precision of $0^s.1$ in right ascension and $1''$ in declination. This publication is available from HMSO and from UNIPUB, 4611/F Assembly Drive, Lanham, MD 20706-4391, U.S.A.

Compact Data for Navigation and Astronomy for 1991–1995 contains data, which are mainly in the form of polynomial coefficients, for use by navigators and astronomers to calculate the positions of the Sun, Moon, navigational planets and bright stars using a small programmable calculator or personal computer. This publication is available from Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU.

Other publications of the United States Naval Observatory

Astronomical Papers of the American Ephemeris[†] are issued irregularly and contain reports of research in celestial mechanics with particular relevance to ephemerides.

U.S. Naval Observatory Circulars[†] are issued irregularly to disseminate astronomical data concerning ephemerides or astronomical phenomena.

Explanatory Supplement to The Astronomical Almanac edited by P. Kenneth Seidelmann of the U.S. Naval Observatory. This book is an authoritative source on the basis and derivation of information contained in *The Astronomical Almanac*, and it contains material that is relevant to positional and dynamical astronomy and to chronology. It includes details of the FK5 J2000-0 reference system and transformations. The publication is a collaborative work with authors from the U.S. Naval Observatory, H.M. Nautical Almanac Office, the Jet Propulsion Laboratory and the Bureau des Longitudes. It is published by, and available from, University Science Books, 20 Edgehill Road, Mill Valley, CA 94941. The UK distributor is WH Freeman, 20 Beaumont Street, Oxford, OX1 2NQ.

MICA 1990-1999 is an interactive astronomical almanac for professional applications. There are versions, with User's Guides, for both Apple Macintosh, and IBM PC and compatibles. *MICA* allows a user to compute, to full precision, much of the tabular data contained in *The Astronomical Almanac*, as well as data for specific times. All calculations are made in real time and data are not interpolated from tables. It replaces *The Floppy Almanac*. *MICA* is distributed by the National Technical Information Service (NTIS) of the U.S. Department of Commerce, Springfield, Virginia 22161. The UK distributor for NTIS is microinfo Ltd., PO Box 3, Omega Park, Alton, Hampshire GU34 2PG.

[†] These publications are available from the Nautical Almanac Office, U.S. Naval Observatory, Washington, D.C. 20392-5420.

Publications of other countries

Apparent Places of Fundamental Stars is prepared annually by the Astronomisches Rechen-Institut in Heidelberg and contains mean and apparent coordinates of 1535 stars of the *Fifth Fundamental Catalogue* (FK5). This volume is available from Verlag G. Braun, Karl-Friedrich-Strasse, 14-18, Karlsruhe, Germany.

Ephemerides of Minor Planets is prepared annually by the Institute of Theoretical Astronomy, and published by the Russian Academy of Sciences. Included in this volume are elements, opposition dates and opposition ephemerides of all numbered minor planets. This volume is available from the Institute of Theoretical Astronomy, Naberezhnaya Kutuzova 10, 191187 St. Petersburg, Russia.

Other Publications of the United States Space Observatory

The National Library of Medicine (NLM) has been publishing a series of reports on the results of the Space Observatory's research in the field of space medicine.

The first report, "Space Medicine: A Review of the Literature," was published in 1970. It was the first of a series of reports that will be published in the future.

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